407 - 444

CONNECTICUT RIVER BASIN
BERLIN, CONNECTICUT

WASEL RESERVOIR DAM

CT. 00260

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

DECEMBER 1978

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0. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Vasel Reservoir Dam is a zoned earth embankment about 350 ft. long with a maximum ieight of about 80 ft. and a crest width of 20 ft. It is about 4,000 ft. long and has ı surface at normal storage of 103 acres. The dam appears to be in good condition. The dam is classified as intermediate in size. The dam has been classified as having a ıigh hazard potential.

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WASEL RESERVOIR DAM
CT 00260

CONNECTICUT RIVER BASIN
BERLIN, CONNECTICUT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.:	CT 00260
Name of Dam:	Wasel Reservoir Dam
Town:	Berlin
County and State:	Hartford County, Connecticut
Stream:	Off-stream
Date of Inspection:	24 October 1978

BRIEF ASSESSMENT

Wasel Reservoir Dam is a zoned earth embankment about 350 ft. long with a maximum height of about 80 ft. and a crest width of 20 ft. It is located at the north end of the reservoir. The dike at the south end is of similar construction, about 1,400 ft. long, with a maximum height of 50 ft. The spillway is located at the left abutment of the main dam, consisting of a 10 ft. wide channel cut through the rock formation around the left end of the dam, and a 2 ft. high concrete control sill with its crest 8 ft. below the crest of the dam. The outlet tower near the left abutment has three 30-in. dia. inlets at varying levels and a 30-in. dia. outlet leading to the filter plant below Shuttle Meadows Reservoir.

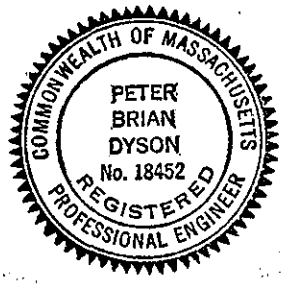
Wasel Reservoir is utilized as a water storage facility by the City of New Britain. It is about 4,000 ft. long and has a surface at normal storage of 103 acres. The drainage area is 0.38 sq. mile and the maximum storage at top of dam is 3,600 acre-ft. The dam is thus classified as intermediate in size. Because failure of either the dam or the dike could damage some homes, including a densely developed part of New Britain, commercial establishments and roads, the dam has been classified as having a high hazard potential.

The dam appears to be in good condition. The spillway is adequate to pass the full PMF test flood without overtopping the dam. The south dike also appears to be in good condition. Seepage at the downstream toe of the dike was noted, as was a wet area of undetermined cause downstream of the dike at the right abutment.

Within two years of receipt of the Phase I Inspection Report, the owner, the City of New Britain, should retain the services of a registered professional engineer and implement the results of his evaluation of the cause of the south dike seepage and wet area.

The owner should also implement the following measures: (1) keep brush growth cut on the downstream slopes of both embankments; (2) inspect outlet and flap valves at the dike for possible leakage; (3) monitor seepage at the south dike periodically during periods of high reservoir level and at least once a year; (4) clear tree and brush growth from the spillway channel; (5) continue the annual technical inspections required by the State as a condition of the issue of a certificate of approval of construction; (6) develop a formal surveillance and flood warning plan; and (7) repair the access roads on the crests of the dam and dike.

Peter B. Dyson
Project Manager



Frederick Esper
Vice President

This Phase I Inspection Report on Wasel Reservoir has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

FRED J. RAVENS, JR., Member
Chief, Design Branch
Engineering Division

SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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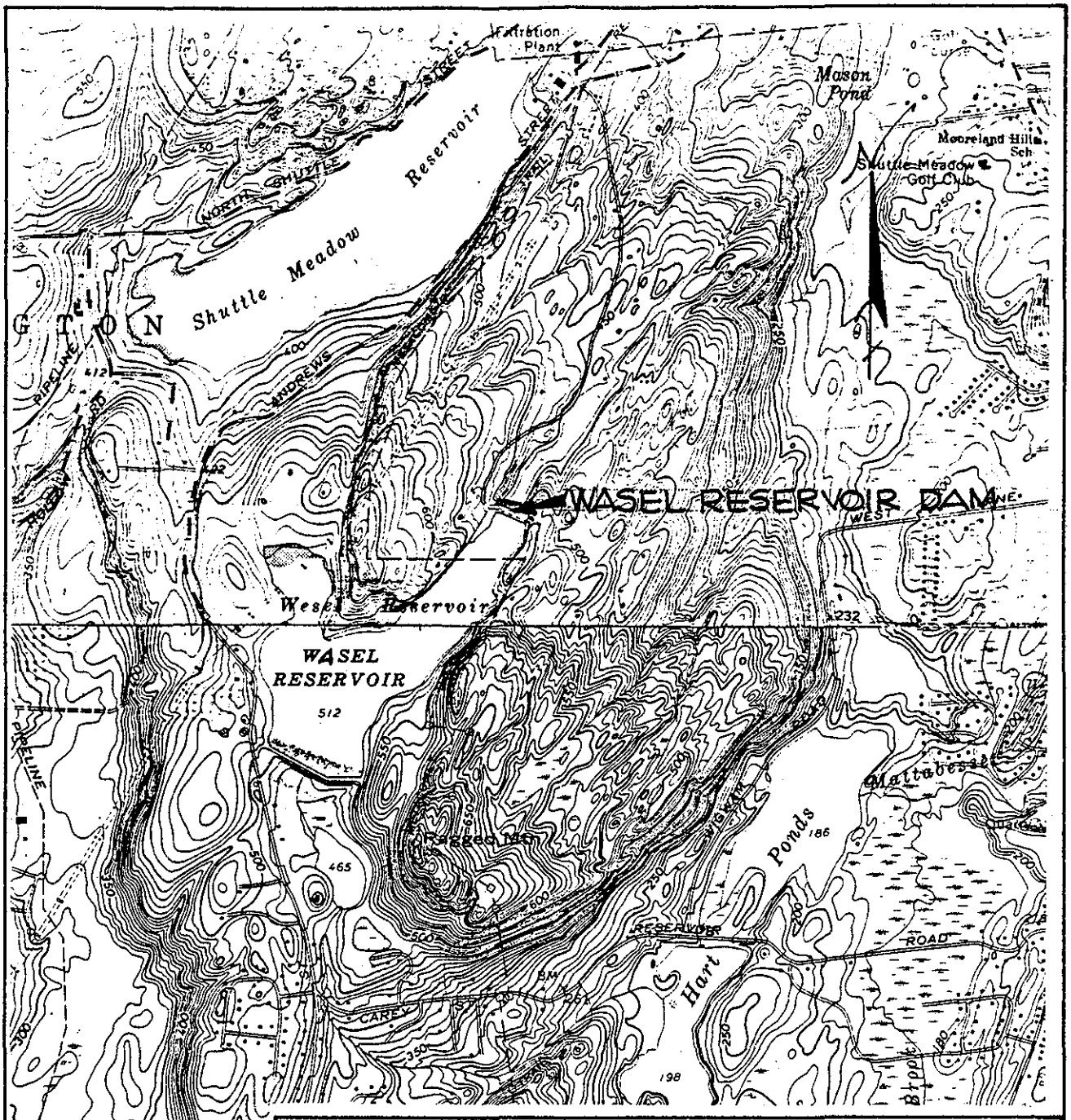


LOUIS BERGER & ASSOC., INC WELLESLEY, MASS. ARCHITECT ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

WASEL RESERVOIR DAM

NEW BRITAIN, MERIDEN CT. QUADRANGLE

CONNECTICUT RIVER BASIN STATE - CT.

			SCALE 1:24000
			DATE

PHASE I INSPECTION REPORT

WASEL RESERVOIR DAM CT 00260

SECTION 1 - PROJECT INFORMATION

1.1 General

a. Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Louis Berger & Associates, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed was issued to Louis Berger & Associates, Inc. under a letter of 24 August 1978 from Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW33-78-C-0371 has been assigned by the Corps of Engineers for this work.

b. Purpose

1. Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

2. Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.

3. To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location

Wasel Reservoir is located in Hartford County about 3 miles southwest of the City of New Britain in Central Connecticut. The reservoir is an off-channel facility within the drainage basin of the Connecticut River, situated in a wide saddle area near Ragged Mountain, such that releases to the north would spill into Shuttle Meadow Reservoir about ½ mile

downhill, and drainage to the south would spill into Hart Ponds about 1½ miles downhill. The water level in Wasel Reservoir is at elevation 512 MSL. The levels of Shuttle Meadow and Hart Ponds are elevations 373 and 198, respectively. The reservoir is utilized as a storage facility for the municipal water supply of the City of New Britain.

b. Description of Dam and Appurtenances

1. Main Dam and Dike

The main dam is located at the north end of the reservoir at a point where the saddle area is confined between steep rock abutments about 350 ft. apart. The base of this dam is at approximately elevation 440 or about 35 ft. lower than that at the saddle dike located to the south. The main dam is a zoned embankment with an impervious core and two pervious outer shells. The crest width of the dam is 20 ft. and the upstream slope is 2½ to 1 and the downstream slope is 2 to 1. The maximum height of the dam from crest to natural ground level is about 80 ft. Deep stripping at the valley section was to depths up to 20 ft., such that the maximum height of the dam from lowest foundation is approximately 100 ft. The dam is about 350 ft. long and contacts almost vertical rock abutment faces.

Cutoff trenches up to 30 ft. beyond the abutment faces were indicated on the design drawings. However, the exact limits of these trenches are not known. Through the central portion of the dam it is not known whether the cutoff trench was carried to bedrock. There is evidence of grouting in the right or easterly abutment. An extensive grout program was conducted in this area and a total of 28 holes were drilled and grouted. Approximately 1,800 lin. ft. of drill holes and 617 cu. ft. of grout were used. Therefore, the unit grout take was about 0.34 bags of cement per lin. ft. of drill hole. The grout program was well documented and appears to have been reasonably well done and successful.

A toe drainage system was incorporated in the downstream shell zone of the main dam as shown on the as-built construction drawings (Appendix B). The system consists of a 6-in. cast iron perforated pipe with a 6-in. cast iron pipe outlet to a manhole. The perforated pipe is surrounded with 3 filter layers varying from fine to coarse sand to small rock and then 1 to 6 in. rock. The drainage system is well filtered and appears to be a good design.

The dike closes the southern end of a saddle area located at the south end of the original Panther Swamp, immediately before the saddle drops off toward Hart Ponds. The valley width at top of dam level at this site is about 1,400 ft. with the valley floor at Panther Swamp level elevation 475. The dam from natural ground level is about 50 ft. high. A wide cutoff trench was indicated to be carried below ground level, but its extent was to be determined during construction. The exact depth of the cutoff trench is not known. However, it is not believed that a cutoff trench was carried to bedrock.

The dike is a zoned earthfill dam with compacted impervious earth core and semi-pervious outer shells. According to some correspondence during the construction period, the material used for the dike was a weathered shale material which was well graded gravel through clay sizes. When compacted, it is highly impervious. Indications are that the dike was well compacted. Top width of the south dike is 20 ft. and both the upstream and downstream slopes are 2½ to 1. A 10 ft. wide berm is also provided on the downstream slope about 24 ft. below the crest of dam. The upstream slope of the dike is covered with riprap and the downstream slope has sod. There is a drainage system located at berm level on the downstream slope so that runoff onto the downstream face is collected into some small catch basins and then discharged at the toe of dam. The south dike also had an extensive toe drainage system. The toe drainage system consisted of a 6-in. perforated cast iron pipe running essentially parallel to the crest of dam with two 6-in. cast iron drains carried to manholes located near the toe of slope at two different locations. The perforated pipe is surrounded by a filter system consisting of 3 layers. The outer layer is a fine to coarse sand. The middle layer is a graded gravel, quarter inch to 3 in. The inner layer is 3/4 in. stone. Each layer is approximately 12 in. thick.

The dike alignment is carried across the valley from the right abutment for a distance of 1,000 ft. to a knoll on the left side. At that point the dam turns upstream about 30 deg. to contact the left abutment about 400 ft. away. The extreme left 100 ft. portion of the dike was constructed with the top of the embankment one ft. lower than the crest of the main dam and dike. It is presumed that this was intended as an emergency spillway.

2. Spillway

The spillway for Wasel Dam is located at the left abutment of the main dam and consists of a channel cut through the rock formation around the left end of the dam. The channel floor is 10 ft. below the crest of the dam, has a 10 ft. bottom width and steep side slopes on a 1 horizontal to 6 vertical batter. The rock through which the channel was cut is hard and competent and was not lined with concrete.

The spillway channel entrance is about 40 ft. upstream from the dam centerline. The channel is carried roughly parallel with the dam axis for about 100 ft. into the abutment, where it turns abruptly about 90 deg. downstream and continues to daylight into a draw about 130 ft. downstream from the dam centerline. A 2 ft. high concrete control sill, placed with its crest 8 ft. below the level of the top of the dam, acts to regulate outflows from the reservoir. A concrete bridge is provided where the access roadway for the dam crosses the spillway channel.

3. Outlets

The main outlet is located at the main, north dam, where a 16 ft. dia. buried outlet tower is located just upstream from the dam crest near the left abutment. A 30-in. dia. low level inlet pipe and two 30-in. inlet pipes at higher selective levels empty into the wet well shaft, each controlled by a 30 in. sluice gate at the end of the pipe and operated from the top of the shaft. A 30-in. dia. outlet pipe takes off from the bottom of the shaft, leading to the filter plant below Shuttle Meadows reservoir. A blowoff valve is located in this line about 1,000 ft. downstream from the Wasel Dam, for releasing bypass flows from the reservoir. A 30-in. sluice gate mounted at the inlet to the outlet pipe serves as a closure control.

A 6-in. auxiliary outlet pipe is located at the south dike. This outlet is controlled by a valve installed in a wet well shaft, into which a planned future 16-in. dia. pump line from Hart Ponds is to empty. This outlet is now in disuse.

c. Size Classification

The Wasel Dam is about 80 ft. high, impounding a storage of 2,700 acre-ft. to spillway crest level, a maximum of about 3,100 acre-ft. to top of surcharge head, and 3,600 acre-ft. to top of dam. In accordance with size and capacity criteria promulgated in the Recommended Guidelines for Safety Inspection of Dams, the project is categorized in the intermediate classification.

d. Hazard Classification

A breach failure of the main dam at Wasel Reservoir would release water down the small stream channel leading to Shuttle Meadow Reservoir to the north. However, since the stream channel is not well defined along the hillside leading to the lower reservoir, it would be possible for large flows to overflow the hillside and spill into the valley to the east. This valley is not well defined until it reaches Willow Creek about 1½ miles distant, and it would be possible to pond the major spillage from the hillside onto a broad area upstream from the Willow Creek channel. Pondage depths of about 30 ft. (or up to elevation 184) could accumulate in a densely inhabited area of south New Britain.

A breach failure of the south dike would release water down a small stream channel leading to Hart Ponds and thence down the Mattabesset River which skirts the south side of Kensington. There are recent housing developments east of Hart Ponds.

It would be expected that there would be danger of some homes being affected with a possibility of loss of life and appreciable economic loss. Consequently, Wasel Reservoir Dam has been classified as having high hazard potential in accordance with the Recommended Guidelines for the Safety Inspection of Dams.

e. Ownership

The dam is owned by the Board of Water Commissioners, City of New Britain, Connecticut.

f. Operator

Mr. John A. McManus
Director of Water Supply
City of New Britain
1000 Shuttle Meadow Avenue
New Britain, CT 06052

Telephone: (203) 224-2491, Ext. 236

g. Purpose of Dam

The Wasel Dam project was constructed by the Board of Water Commissioners, City of New Britain. The reservoir is operated in conjunction with the Shuttle Meadow reservoir and other facilities for water supply for the City of New Britain. Since the inflow and yield from the Wasel Reservoir drainage basin is small, the operating plan uses available storage space in Wasel by pumping any surplus water from Shuttle Meadow Reservoir and collection system. It is planned ultimately to pump also from Hart Ponds with a similar arrangement.

h. Design and Construction History

The Wasel Reservoir Dam and appurtenances were designed by Malcolm Pirnie Engineers, New York, on behalf of the Board of Water Commissioners, City of New Britain. The State of Connecticut, Water Resources Commission, issued a construction permit on March 26, 1965, and a certificate of approval of the work on June 20, 1967. A. J. Macchi, Engineers, of Hartford were retained by the Water Resources Commission to inspect the work on behalf of the State. The contractor was Angelo Tomasso of New Britain.

According to correspondence in the files of the CT Department of Environmental Protection, the State's consultant expressed an opinion that the material forming the outer parts of the dike (shown on the drawings in Appendix B as "Class B Fill") was of a very impervious nature and unsuitable for use in the downstream segment. His concern centered around the hypothesis that under conditions of a deep frost, the surface could be sealed off and a hydrostatic head built up within the section, leading to possible sloughing of the downstream face. The consulting firm of Mueser, Rutledge, Wentworth and Johnston was called in to review the design and construction, and on March 8, 1966, they issued a report (Appendix B). This report

indicates general satisfaction with the design and construction but recommends periodic inspection of the toe of the embankment for possible softening and sloughing, with installation of a sand and gravel filter layer on the slope if needed.

It is noted that the State's consultant recommended that approval of construction be made conditional upon an annual inspection being made each spring by a competent engineer. Copies of reports dated May 7, 1968, by the design engineers and May 8, 1968, by the State's consultant are included in Appendix B. Both recorded wet areas in the vicinity of the downstream toe of the dike. A report dated April 4, 1973, by Macchi & Hoffman, Engineers, records that there was no evidence of sloughing of the downstream face of the dike. It appears that up to now it has not been deemed necessary to install a drainage layer on the downstream slope. No other inspection reports have been recovered.

i. Normal Operational Procedure

Operators are on duty around the clock at the filter plant below Shuttle Meadow Reservoir and are available to periodically check the reservoir conditions at Wasel. Outlet gate operation at Wasel Dam is not a day-to-day procedure.

1.3 Pertinent Data

a. Drainage Area

The drainage area contributing to the Wasel Reservoir consists principally of the hillsides on each side and the reservoir area proper, which encompass a total of 246 acres (0.38 sq.mi.). The surface area of the lake at normal storage level is 103 acres, or 42 percent of the total drainage basin. Runoff from rainfall on the adjoining areas to the lake would be rapid.

b. Discharge at Damsite

1. Outlet works conduit

Discharge from Wasel Reservoir is provided by a single 30-in. dia. outlet pipe leading to the Shuttle Meadow filter plant, with a bypass blowoff placed in the line about 1,000 ft. below the dam. The invert elevation of the outlet pipe at the dam is at about the level of the bottom of the reservoir, elevation 440.

2. Maximum Flood at Damsite

Since the Wasel Reservoir is constructed as an off-stream facility in the area which forms a divide between two drainage basins, no flows of consequence have been recorded.

3. Ungated Spillway Capacity

The spillway at Wasel Dam is an ungated structure. The total spillway capacity at top of dam elevation is about 820 cfs.

4. Total Spillway Capacity at Maximum Pool Elevation

The discharge for a maximum flood event is computed at 275 cfs. at a 3.7 ft. surcharge over the spillway crest.

c. Elevations (ft. above MSL)

1. Top of dam - 520.0
2. Maximum pool design surcharge - 516.0
3. Spillway crest - 512.0
4. Upstream portal invert diversion tunnel - 440.25
5. Streambed at centerline of dam - 439

d. Reservoir Length (ft.)

1. Length at maximum pool - ± 4,000
2. Length at normal storage pool - ± 4,000

e. Reservoir Storage (acre-feet)

1. At normal storage pool - 2,700
2. At design surcharge - 3,070
3. At top of dam - 3,588

f. Reservoir Surface (acres)

1. Top of dam - 120
2. Maximum pool - 110
3. Spillway crest - 103

g. Main Dam

1. Type - zoned earthfill
2. Length - 380 ft.
3. Structural height - 100 ft.
4. Hydraulic height - 80 ft.
5. Top width - 20 ft.
6. Side slopes - 2½ to 1 upstream; 2 to 1 downstream
7. Zoning - compacted Class "A" fill on 0.6 to 1 slopes; compacted Class "B" outer shells
8. Cutoff into rock abutments not a certainty; wide foundation cutoff up to 20 ft. deep, contact with foundation bedrock improbable.
9. Grout curtain at east abutment bedrock. Approximately 1,800 lin. ft. of grout holes and 617 cu. ft. of grout were used.

h. South Dike

1. Type - zoned earthfill
2. Length - 1,400 ft.
3. Height - 50 ft.
4. Top Width - 20 ft.
5. Side slopes - 2½ to 1 upstream and downstream
6. Zoning - compacted Class "A" fill to 0.6 to 1 slopes; compacted class "B" outer shells
7. Shallow wide cutoff into foundation; depth unknown. Contact with bedrock improbable.
8. No grout curtain indicated

i. Spillway

1. Type - unlined channel in rock
2. Length of weir - 10 ft.
3. Crest elevation - 512 MSL
4. Ungated
5. Upstream channel - unlined in rock cut
6. Downstream channel - unlined in rock cut
7. General - 2 ft. high control sill at elevation 512

j. Regulating outlets

The outlet installations are described in Section 1.2b.

1. Invert - Elevation 440.25
2. Size - 30-in. dia. R.C. pipe
3. Control mechanism - 30-in. sluice gate at entrance; 30-in. gate valve blowoff in 30-in. pressure line to filter plant

SECTION 2 - ENGINEERING DATA

2.1 Design

The Wasel Reservoir Dam and appurtenances were designed by Malcolm Pirnie Engineers of New York City and are on file at the offices of the Director of Water Supply, City of New Britain. The drawings show complete details of the designs and layout (Appendix B). Some details such as cutoff excavation depths were specified to be by direction of the construction engineer and documentation of actual depths has not been found. Detailed records of grouting of the east abutment bedrock, however, were found and reviewed.

2.2 Construction

The dam and appurtenances were constructed in 1965-66 by contract under the supervision of the design engineers. The contractor was Angelo Tomasso of New Britain. A. J. Macchi, Engineers, inspected the work on behalf of the State Water Resources Commission. The State issued a certificate of approval of the work on June 20, 1967. A letter transmitting the certificate indicated that an annual inspection should be made each spring by a competent engineer.

Correspondence in the files of the CT Department of Environmental Protection indicates that construction was generally performed in an acceptable manner. The State's consultant expressed concern about possible sloughing of the downstream face of the dike due to the impervious nature of the fill material. There is no visual evidence of any such sloughing to date.

2.3 Operation

No specific operation data or operation and maintenance manuals have been issued, either by the design engineers or by the operating agency. Operation of the reservoir is a responsibility of the Director of Water Supply, City of New Britain.

2.4 Evaluation

a. Availability

The original plans, correspondence concerning construction of the dam and appurtenances, previous inspection reports and the visual observations of the inspection team form the basis for the information presented in this report.

b. Adequacy

The lack of in-depth data, such as shear strengths of the embankment materials, precludes a definitive review and assessment of this dam. The evaluation is based primarily on visual inspection and engineering judgment, while taking into account the past performance of the dam.

c. Validity

The validity of the engineering data acquired covering the main dam and south dike is considered acceptable and is not challenged.

SECTION 3 - VISUAL INSPECTION

3.1 Findings

a. General

The visual inspection of Wasel Reservoir Dam took place on 24 October 1978. Both the main dam and north dike appear to be in good condition. Built 13 years ago, the facility appears to have been well designed and constructed. There was no evidence of any major maintenance problems.

b. Dam and Dike

1. Main Dam

There are massive bedrock outcrops well exposed on both the right and left abutments of the main dam (see overview photos). The rock is a vertically jointed basalt. There is one massive overhang of bedrock on the right abutment located at about a third of the way down the downstream slope. While a portion of this rock mass could fall, perhaps several hundred cu. yds. in extent, it would probably not endanger the safety of the dam.

The horizontal and vertical alignment and the condition of the crest of the dam are good. There is a paved road at the top of the dam about 10 ft. wide which shows some signs of minor deterioration. Appendix C, Photo No. 1, is a general view of the downstream slope of the dam. Note the generally good condition of the dumped rock face of the dam. There is some minor brush growth, generally not exceeding about 8 ft. high, on the downstream slope from the toe up to about the 1/3 point.

There is a small shallow pond perhaps 100 ft. wide and 200 ft. long located about 200 ft. from the toe of the downstream slope (Appendix C, Photo No. 2). This pond is believed to be a low area in the topography where the seepage from the dam collects. The manhole located near the left abutment was opened and inspected (Appendix C, Photo No. 3). The manhole sticks up out of the ground about 18 in. and has a total depth of about 10 ft. The water in the manhole was about 6 ft. deep but the direction of flow could not be determined.

There is a 30-in. dia. reinforced concrete pipe emanating from a headwall located about 1,000 ft. from the downstream toe of the dam. This is believed to be the blowoff from the water supply outlet from the reservoir.

Near the left abutment there is a spillway channel cut into the rock which then takes a right angle bend, goes under a little bridge and heads on downstream to intersect a natural drainage gully. The concrete spillway control is in this channel (Appendix C, Photo Nos. 4 & 5).

Generally the rock riprap on the upstream slope is in excellent condition with no evidence of movement or potholes. There is some minor brush growth on the slope. There is a depressed area noticeable in the upstream slope located approximately 50 ft. from the right abutment. The shape of the sag is probably 50 ft. across, 50 ft. down the slope and perhaps 3 or 4 ft. deep. It is not apparent whether it was built this way or results from settlement; however, it is probably not due to settlement because there is no evidence of any cracking or settlement at the crest of the dam.

2. South Dike

The south dike of Wasel Reservoir was also viewed (Appendix C, Photo No. 6). The alignment, both horizontal and vertical, is good and the crest of the dike is in good condition. The bituminous pavement of the crest is in fair to poor condition. The riprap on the upstream slope of the dike is in excellent condition. The downstream slope is also in excellent condition. It is a grass slope with a berm about two-thirds of the way down, with no evidence of any bulges or movement of the slope. The lower portion of the downstream slope below the berm is covered with light brush growth. As one proceeds from the right abutment towards the left abutment, the dike takes a bend in the upstream direction about two-thirds of the way across the length of the dike. Just to the left of where this bend occurs, there is an outlet for a toe drain and a concrete manhole measuring about 6 ft. wide and 4 ft. deep. The outlet pipe from this manhole is a cast iron pipe and some minor seepage of approximately 1 or 2 gallons a minute was observed. The water was clean and clear.

There are some catch basins located at the berm level on the downstream slope which were noted to be dry at the time of the inspection. A second toe drain discharge located closer to the right abutment was also inspected. This is a reinforced concrete square manhole with a rim on it and the water just at the toe of this was observed to be clear. No evidence of springs or major seepage was noted along the downstream slope. There is a wet area right at the toe of embankment near the manhole which is about 6 ft. wide and perhaps 20 ft. long. The total visible seepage emanating from this point is probably of the order of 10 gallons a minute and the seepage is clear, clean water.

With the exception of the two seepage points previously noted, there is no evidence of seepage along the downstream toe below the berm level for most of the length of the dike. However, there is a marshy area at the downstream toe of the berm on the downstream slope, from a point about 300 ft. from the right abutment and covering an area approximately 300 ft. long and 100 ft. wide. The toe of the downstream slope below the berm is wet through this whole area, but the water source which maintains this wet area was not evident. The reservoir level was down about 11 ft. below normal, such that foundation seepage would be reduced, if that is the cause of the high water table. Another possible source which may maintain the wet area is leakage either from the 6 in. dia. outlet or from the 16-in. dia. pump line stub leading from the outlet tower. It was not possible during the inspection to investigate this latter premise.

c. Appurtenant Structures

The spillway channel is unlined but the rock cut in the channel is stable and should not be of particular concern in regard to ravelling or rock falls. Some brush and tree growth has established itself in the channel, which might best be grubbed out (Appendix C, Photo No. 5).

The outlet gates at the main dam were not operated during the inspection, but according to Water Supply Department staff the gates and valves function properly. The outlet valve and flap valve installed in the shaft at the dike should be inspected for possible leakage to determine whether that is the source of water which maintains the swampy area at the toe of the dike at the right abutment.

d. Reservoir Area

The reservoir at the north end is confined between nearly vertical rock abutments which rise to about 50 ft. above the top of dam on the right side and to over 100 ft. above on the left side. The rock is quite massive but columnar jointed, and rock falls into the reservoir or other displacement towards the dam are a possibility.

The reservoir shoreline along the southern end of the reservoir is of much flatter slopes and appears to be quite stable, with no evidence of sloughing into the reservoir.

e. Downstream Channel

The valley below the main dam to the north into which spillway releases would discharge is about 300 ft. wide and quite swampy, with no well defined stream. Where the stream becomes defined and turns to flow into Shuttle Meadow Reservoir, it is perched along the slope of a rather steep hillside. If large outflows were to issue through the spillway it is possible that the small stream bank could be overtopped on the downhill side, in which instance the flows would be bypassed directly into the valley into a residential area to the east. Because of heavy undergrowth and lack of detailed topography, the exact condition along the stream channel could not be evaluated.

3.2 Evaluation

The visual inspection of the main dam and dike revealed sufficient information to permit an assessment to be made of those features affecting the safety and stability of the structure. The main dam, dike and appurtenant works are judged to be in good condition.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures

The Wasel Dam facility is operated by personnel of the New Britain Water Department, who are stationed at the filter plant about 1½ miles below the dam. Reservoir operation entails mainly the release of stored water from the reservoir to augment that from Shuttle Meadow Reservoir as water supply needs warrant. The outlet from Wasel Reservoir to the filter plant is a pressure pipe with valves at the outlet of the pipe, such that day-to-day regulation of the gates at the dam is not needed. No documented operating procedures have been prepared.

4.2 Maintenance of Dam and Dike

At the main dam, except for periodic cutting of brush and tree growths on the slopes of the dam, little maintenance is required. The area surrounding the dam is periodically patrolled for vandalism and damage but no untoward incidents have been experienced to date.

At the south dike, the downstream sodded slope and the sodded upper portion of upstream slope are kept mowed and presents an attractive appearance. The area adjacent to the right abutment of the dike has been dedicated as a public park, and periodic vandalism to a memorial area has occurred. Except for trash and beer bottles found in the outlet tower chamber on the dike, no other evidences of vandalism were observed.

No documented maintenance instructions have been prepared.

4.3 Maintenance of Operating Facilities

Except for the housekeeping maintenance noted above, no specific maintenance program is in effect. It is presumed that some maintenance to the gates and valves has been performed in the past to keep the mechanisms operative.

4.4 Warning System

No warning system is in effect at Wasel Reservoir Dam.

4.5 Evaluation

The Wasel Reservoir facility is of recent construction with simple operating devices and, as such, requires no detailed operating procedures. Maintenance involves periodic growth removal from the dam and surveillance regarding seeps, slope damage, animal burrows, etc. Inspection observations noted that the facility appears to be well maintained.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data

Hydrologic characteristics of Wasel Reservoir Dam, its drainage area and downstream area were evaluated in accordance with criteria presented in the Recommended Guidelines for Safety Inspection of Dams. As indicated in Section 1.2, paragraphs c & d of this report, Wasel Reservoir Dam has been accorded an intermediate classification with a high hazard potential rating. Consequently, the test flood selected to evaluate the adequacy of the dam was a full PMF event.

Figure 1, Sheet D-1, in Appendix D shows the area-capacity curves for the Wasel Reservoir, as computed by the design engineer. An acre-foot scale has been added to facilitate relating the area in acres to the capacity in acre-feet.

For the purpose of determining potential runoff from the 246 acre drainage area, the inflow flood hydrograph prepared by the design engineer is included in this report in Appendix D as Figure 2, Sheet D-2. The hydrograph is based on a 24-hour PMP of 28.5 in., peaking at about the 8th hour of the rainfall storm, at about 1,280 cfs. (see Sheets D-3 and 4, Appendix D). The total volume of the storm inflow would approximate 575 acre-ft.

According to that shown on Figure 2, Appendix D, the routing of the above PMP inflow flood through the reservoir and spillway results in a maximum spillway outflow of about 275 cfs. at reservoir surcharge head of 4.0 ft., to elevation 516.0. With top of dam at elevation 520, freeboards of 8 ft. over normal storage and 4.0 ft. over maximum surcharge storage would be realized. It is thus apparent that a threat of overtopping of the dam would not be possible.

b. Experience Data

It appears that no outflows have spilled from the reservoir since the dam was built.

According to the records of the Water Department, the rainfall during the 1955 flood was as follows:

1st 24 hours	0.89 in.
2nd 24 hours	7.75 in.
3rd 24 hours	0.56 in.
Total in 72 hours	9.20 in.

c. Visual Observations

The reservoir was at a level about 11 ft. below spillway crest at the time of the inspection. Since the spillway has never operated, no scour channel has been eroded below the spillway.

d. Overtopping Potential

As noted in Section 5.1a, the maximum surcharge head resulting from the routing of a PMF would reach 4.0 ft., leaving a freeboard to top of dam of 4.0 ft.; and to the top of the 100 ft. low area of the dike of 3.0 ft. On this basis, the threat of an overtopping of the dam and/or dike owing to a maximum flood event would not materialize.

e. Drawdown Capacity

Drawdown of the reservoir is possible by releases through the outlet at the main dam and in an emergency through the outlet pipes and pump line inlet at the south dike. Figure 3, Sheet D-7, in Appendix D shows discharge capacities of the 30 in. dia. outlet at the main dam and of the 6 in. dia. drain and 16 in. dia. pump line leading from the outlet tower at the dike. In the event that the reservoir was to be evacuated, with the outlets at the main dam and at the dike fully open, it is estimated that more than 20 days would be required to empty the reservoir. Figure 4, Sheet D-9, shows a reservoir level versus time curve for such an emptying.

f. Downstream Hazard

Breaching of the main dam or south dike by overtopping is most unlikely, as noted in Section 5.1d, but a breach because of structural failure of the dam or dike by piping or sloughing could occur. A breach from that cause would be similar to that from an overtopping and the "rule of thumb" criteria suggested in the NED March 1978 Guidance Report would be applicable. For a 100 ft. wide sudden breach failure washing out to the base of the main dam, a release up to 100,000 cfs. could empty into the downstream valley; a 50 ft. breach failure would release up to 50,000 cfs. On the basis of a 50 ft. breach, plotted on Figure 5, Sheet D-11, are curves showing discharge and reservoir elevation versus emptying time.

At the dike a 50 ft. breach failure would release up to 23,000 cfs. Plotted on Figure 6, Sheet D-13, are curves showing discharge and reservoir elevation versus emptying time for a 50 ft. breach at the dike.

The areas which could be flooded by a breach failure of either the main dam or south dike are delineated on a map, Figure 7, Sheet D-15, in Appendix D. For a breach of the dam, pondage depths of about 30 ft. could accumulate in south New Britain. For a breach of the dike, homes east of Harts Pond would be affected.

SECTION 6 - STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

The field investigations of the main earth embankment and dike revealed no significant displacements or distress which would warrant the preparation of slope stability computations based on assumed soil properties and engineering factors. Both the main dam embankment and the south dike are in good condition. However, several items requiring maintenance or continued observation are evident, as follows:

1. Minor brush growth on the lower one-third of the downstream slope of the main embankment should be cut on a regular basis. Brush growth on the lower portion of the downstream slope of the dike should also be cut.

2. The roadway surface on the south dike has deteriorated. If continued vehicular traffic is contemplated, the pavement should be replaced. However, the lack of pavement does not endanger the stability of the dike.

3. The seepage at the downstream toe of the south dike should continue to be monitored for quantity and clarity on a yearly basis.

4. The wet area downstream of the toe of slope at the right abutment of the dike should be studied to determine the cause and whether the use of drainage ditches and/or trenches is feasible. Test borings and groundwater monitoring might be required for such a study. However, a definitive recommendation is beyond the scope of this report.

b. Design and Construction Data

"As built" plans for the dam and dike were reviewed. However, since shear strength data of the embankment material and foundation were not available, a detailed stability analysis was not deemed worthwhile. The design of the dam and dike appeared generally consistent with good earth dam embankment design practice.

c. Operating Records

The Water Supply Department records the elevation of water in the reservoir on a daily basis.

d. Post Construction Changes

The results of the field inspection and a check of the available records produced no evidence of changes which might impair stability of the dam or dike.

e. Seismic Stability

The dam is located in Seismic Zone No. 2 and, in accordance with recommended Phase I guidelines, does not warrant seismic analyses.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition

On the basis of the Phase I visual examination, Wasel Reservoir Dam appears to be in good condition and functioning as intended by the designer. The deficiencies revealed are not of major concern, but tend to indicate that a small amount of additional routine maintenance is required. The spillway capacity is adequate to pass the test flood without overtopping the dam.

There is some seepage and a wet area downstream of the south dike. From the records it appears that this condition has existed since the reservoir was first put into service about ten years ago.

b. Adequacy of Information

The information recovered is considered adequate for the purpose of making an assessment of the performance of the dam.

c. Urgency

The recommendations and remedial measures enumerated below should be implemented by the owner within two years after receipt of the Phase I Inspection Report.

d. Need for Additional Investigation

The only significant potential problem identified from the visual inspection is the seepage at the downstream toe of the south dike and the wet area downstream of the toe of slope at the right abutment. This should be investigated by a competent registered professional engineer. If proved necessary, remedial works to rectify matters should be designed or specified.

7.2 Recommendations

It is recommended that the owner should retain the services of a competent registered professional engineer to make investigations, studies, and, if proved necessary, design remedial works to rectify the seepage and wet area downstream of the toe of the south dike.

7.3 Remedial Measures

a. Operation and Maintenance Procedures

1. Minor brush growth on the downstream slopes of both the main dam and south dike should be cut on a regular basis.

2. The outlet valve and flap valve installed at the dike should be inspected for possible leakage.

3. The seepage at the downstream toe of the south dike should be monitored during periods of high reservoir level and at least once a year.

4. The tree and brush growth in the spillway channel should be removed and the channel kept clear of debris.

5. The annual inspections each spring required by the State should be continued.

6. A formal surveillance, flood warning and emergency evacuation plan should be developed.

7. The dam and dike access roads should be repaired and given a surface treatment periodically.

7.4 Alternatives

There are no practical alternatives to the above recommendations.

APPENDIX A

VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION
PHASE I

Identification No. 00260 Name of Dam: Wasel Reservoir Dam

Date of Inspection: 24 October 1978

Weather: clear Temperature: 50°F

Pool Elevation at Time of Inspection: 501 MSL

Tailwater Elevation at Time of Inspection: Not applicable

INSPECTION PERSONNEL

Pasquale E. Corsetti	Louis Berger & Assoc., Inc.	Acting Proj.Mgr.
Carl J. Hoffman	Louis Berger & Assoc., Inc.	Hydraulics, Structures
Thomas C. Chapter	Louis Berger & Assoc., Inc.	Hydrology, Soils
William S. Zoino	Goldberg Zoino Dunnicliff & Assoc., Inc.	Soils

OWNER'S REPRESENTATIVE

John A. McManus	City of New Britain	Director of Water Supply

VISUAL INSPECTION CHECKLIST

Identification No. 00260 Name of Dam: Wasel Reservoir Dam Sheet 1

VISUAL EXAMINATION OF	OBSERVATIONS AND REMARKS
EMBANKMENT Vertical alignment and movement	No movement evident at dam or dike.
Horizontal alignment and movement	No movement evident at dam or dike. Dam has gully in upstream slope near crest 50 ft. from right abutment (50' x 50' x 3').
Unusual movement or cracking at or near the toe	None evident at dam or dike.
Surface cracks	Minor cracks in asphalt pavement on dam. Asphalt pavement on dike is deteriorating.
Animal burrows and tree growth	No burrows observed. Minor brush growth on downstream slopes.
Sloughing or erosion of slopes	None evident.
Riprap slope protection	Good condition.

VISUAL INSPECTION CHECKLIST

Identification No. 00260 Name of Dam: Wasel Reservoir Dam

VISUAL EXAMINATION OF	OBSERVATIONS AND REMARKS
Seepage	Negligible at main dam. At dike, clear seepage from toe drains 1-2 gpm left side, 10 gpm right side.
Piping or boils	None evident.
Junction of embankment and abutment, spillway and dam	Dam - good. Dike - wet area downstream on right abutment, 300 ft. x 100 ft.
Foundation drainage	Toe drains functioning at both dam and dike.
OUTLET WORKS Approach channel	None.
Outlet conduit concrete surfaces	None.
Intake structure	Not visible.
Outlet structure	Not visible.

VISUAL INSPECTION CHECKLIST

Identification No. 00260 Name of Dam: Wasel Reservoir Dam Sheet 3

VISUAL EXAMINATION OF	OBSERVATIONS AND REMARKS
Outlet channel	None.
Drawdown facilities	30-in. dia. sluice valve, manual operation.
SPILLWAY STRUCTURES Concrete weir	2 ft. high sill in rock channel, condition good.
Approach channel	Cut in rock, condition good.
Discharge channel	Cut in rock, condition good except for brush and small trees.
Stilling basin	None.
Bridge and piers	10 ft. span by 9 ft. high over discharge channel.
Control gates and operating machinery	None.

VISUAL INSPECTION CHECKLIST

Identification No. 00260 Name of Dam: Wasel Reservoir Dam

VISUAL EXAMINATION OF	OBSERVATIONS AND REMARKS
INSTRUMENTATION Headwater and tailwater gages	None.
Embankment instrumentation	None.
Other instrumentation	None.
RESERVOIR Shoreline	Massive bedrock outcrops at both abutments of main dam; overhang at right abutment not a safety hazard. Remainder gentle slopes, appear stable.
Sedimentation	None observed.
Upstream hazard areas in event of backflooding	Not applicable - off stream.
Alterations to watershed affecting runoff	None noted.

VISUAL INSPECTION CHECKLIST

Identification No. 00260 Name of Dam: Wasel Reservoir Dam

VISUAL EXAMINATION OF	OBSERVATIONS AND REMARKS
DOWNSTREAM CHANNEL Constraints on operation of dam	None.
Valley section	Wide valley, small stream.
Slopes	Vertical rock faces near dam, then flattens out farther downstream.
Approx. No. of homes/population	None.
OPERATION & MAINTENANCE FEATURES Reservoir regulation plan, normal conditions	No formal plan. Water released as required.
Reservation regulation plan, emergency conditions	None.
Maintenance features	Grass slopes mowed regularly. Brush cut periodically.

APPENDIX B

PLANS, RECORDS & PAST INSPECTION REPORTS

Plans obtained from the City Engineer, City of New Britain, Connecticut:

Panther Swamp Project (Wasel Reservoir)

Sheet	Title
1	Dam - Location & Clearing Plans
2	Dam - Plan, Profile, Section & Details
3	Dam - Spillway Channel, Bridge & Details
4	Dam - Intake Tower - Plan & Sections
5	Dam - Intake Tower - Details
6	Access Road - Plan, Profile & Details
7	Dike - Plan & Profile
8	Control Chamber & Dike - Plans & Sections
9	Dike - Details

CITY OF NEW BRITAIN, CONN.

PANTHER SWAMP PROJECT

PANTHER SWAMP DAM, ACCESS ROAD & DIKE

CONTRACT NO. 1

JANUARY 1965

INDEX

JAMES F. DAWSON
MAYOR

BOARD OF WATER COMMISSIONERS

SILVIO A. SILVERIO
CHAIRMAN

JOSEPH A. CROWLEY HUGH ROWLAND JOSEPH C. ROPIAK

DOMONIC A. NAPLES
CHIEF ENGINEER

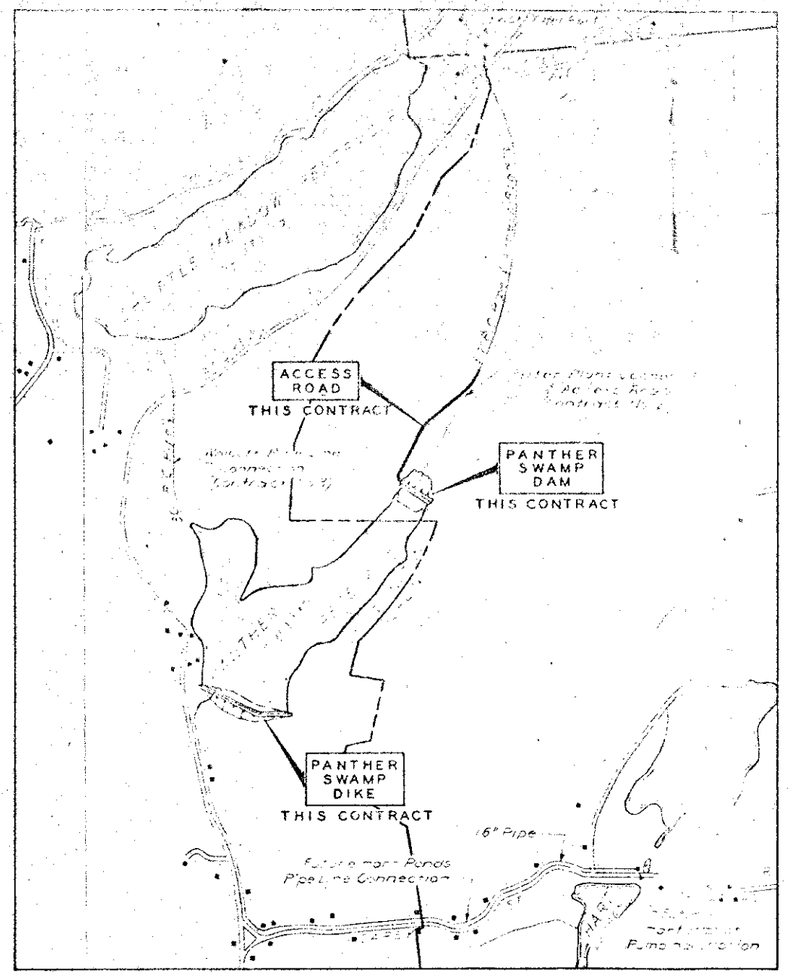
MALCOLM PIRNIE ENGINEERS
NEW YORK, N.Y.

HP-08

WATER 54

AS BUILT

HP-08



LOCATION PLAN
SCALE: 1"= 1000'

LEGEND

- Clearing Line, El. 515.0
- Grubbing Line
- 500 Existing Contours
- City of New Britain Prop. Line
- Stone Wall
- Fence
- Existing Road
- Marsh
- Wooded Area

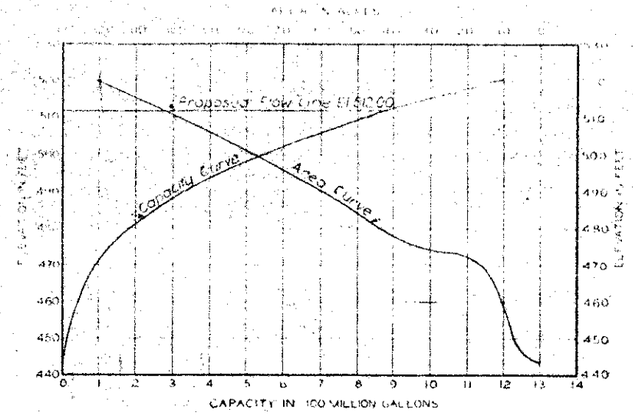
Note: Numbers ① thru ⑦ are sheds which are to be demolished and removed as specified under Item 2E.

CLEARING PLAN
SCALE: 1"= 200'

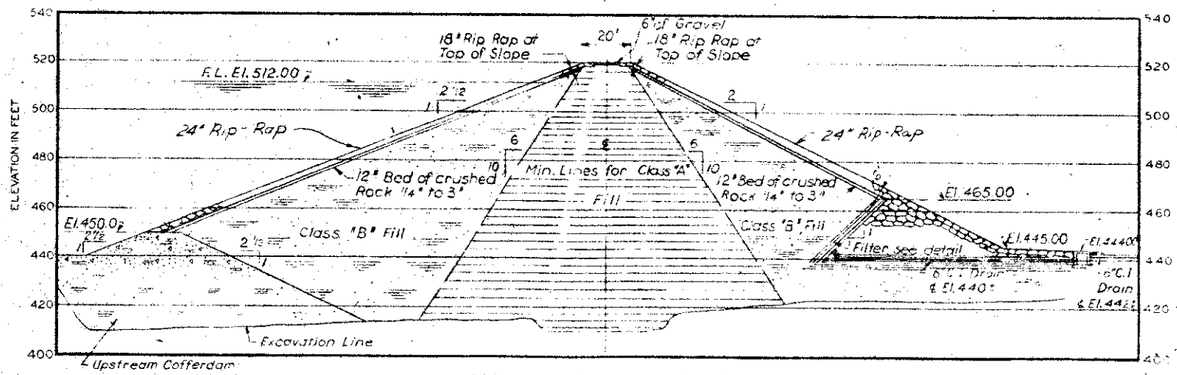
"AS BU[illegible]"

MALCOLM PIRNIE ENGINEERS 522 FIFTH AVE., NEW YORK, N. Y.	RDM	DESIGNED V. J. F. DRAWN V. J. F. CHECKED [illegible] REVISIONS: 4 - 5 - 65	CITY OF NEW BRITAIN, CONN. PANTHER SWAMP PROJECT CONTRACT NO. 1 PANTHER SWAMP DAM, ACCESS RD. & DIKE	DAM LOCATION AND CLEARING PLANS SCALES AS INDICATED	DATE JANUARY 1965 SHEET 1 OF 9 DWG. NO. 1315-61.001-0

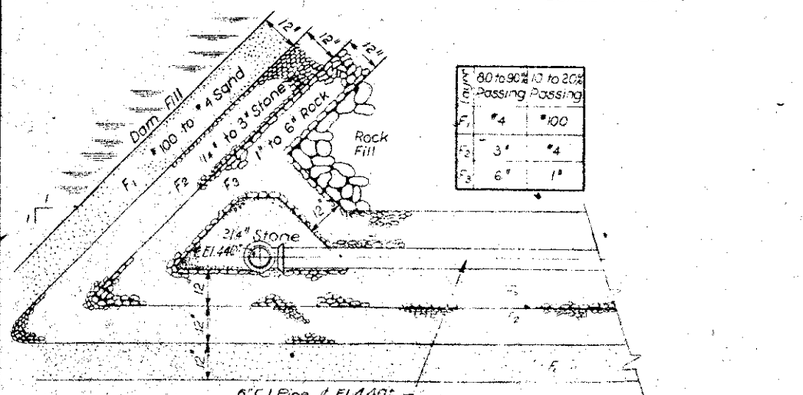
HP-C2



AREA AND CAPACITY CURVES

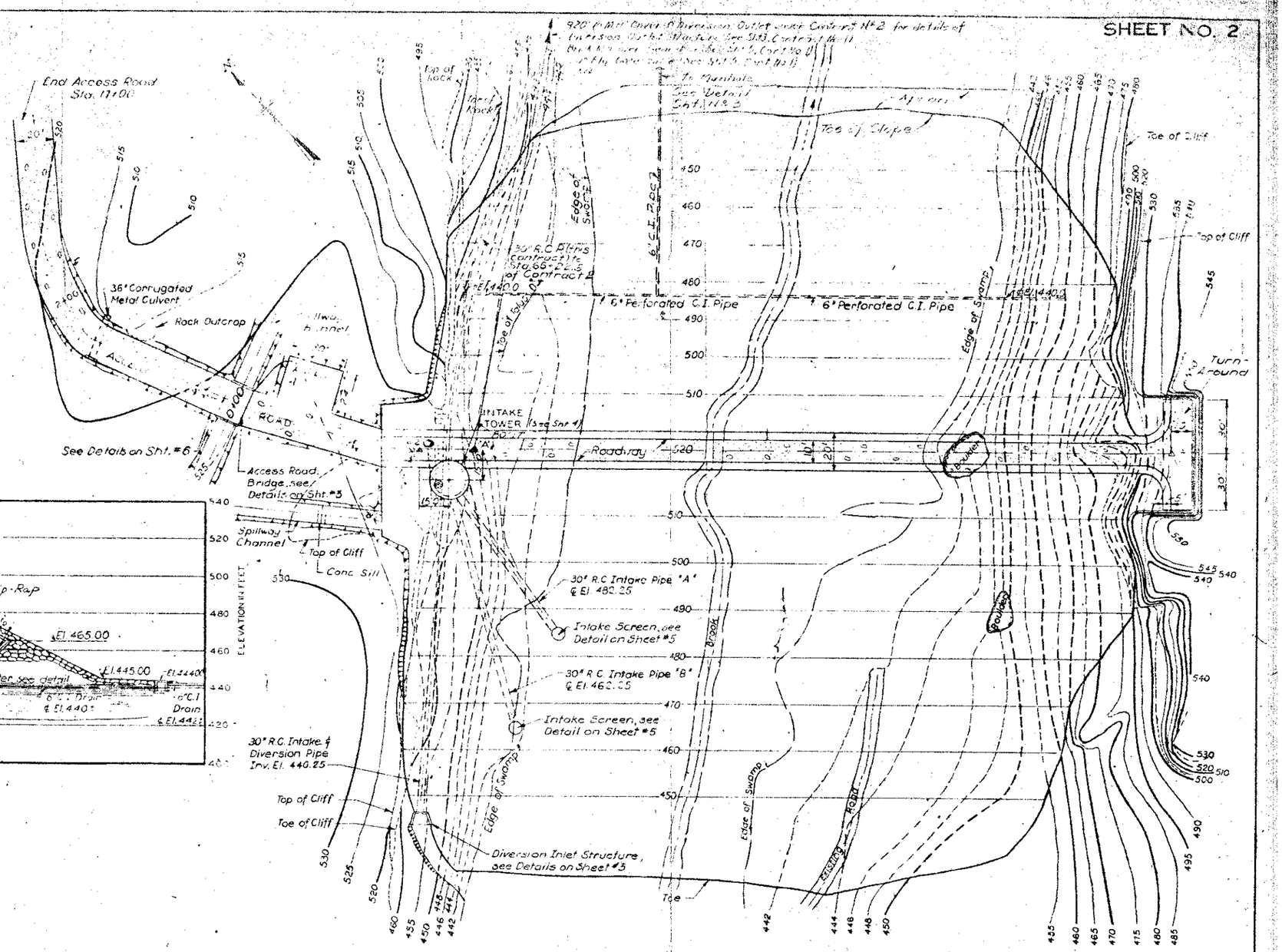


MAXIMUM SECTION OF DAM
SCALE: 1"= 30'-0"

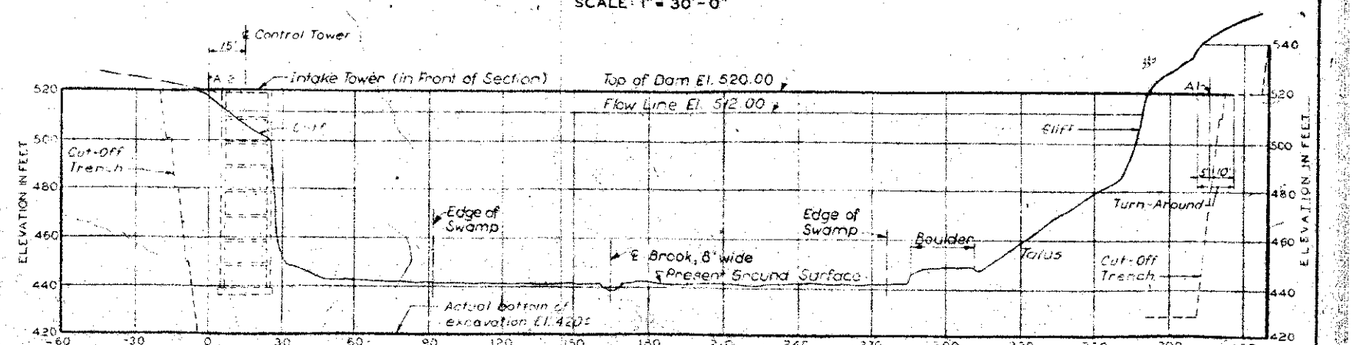


FILTER DETAIL
NOT TO SCALE

Note: Filter material as shown here in cross-section is to be installed for entire length of Dam.



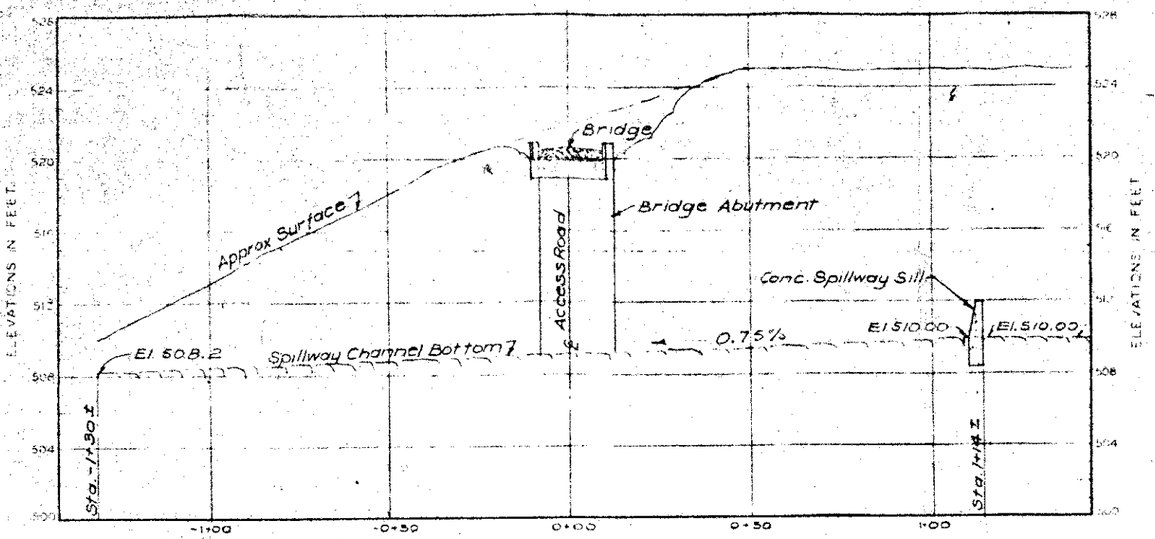
PLAN
SCALE: 1"= 30'-0"



PROFILE ALONG CENTER LINE A_2-A_1
SCALES: HOR. & VERT. 1"=30'-0"

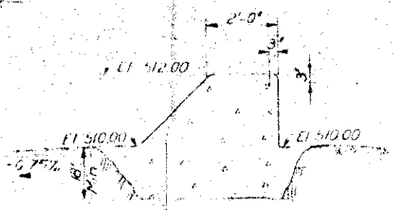
MALCOLM PIRNIE ENGINEERS 25 W. 43RD ST., NEW YORK, N.Y.		DESIGNED A.S. DRAWN C.G. CHECKED REVISIONS: 4-5-65	CITY OF NEW BRITAIN, CONN. PANTHER SWAMP PROJECT CONTRACT NO. 1 PANTHER SWAMP DAM, ACCESS RD. & DIKE	DAM PLAN, PROFILE, SECTION AND DETAILS SCALES AS INDICATED	DATE JANUARY 1965 SHEET 2 OF 9 DWG. NO. 1338-61.002

HD-08

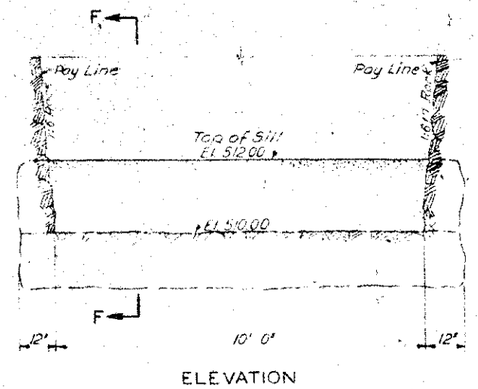


SPILLWAY CHANNEL CENTER LINE PROFILE

TYPICAL SPILLWAY SECTION
SCALE: 1/4" = 1' - 0"

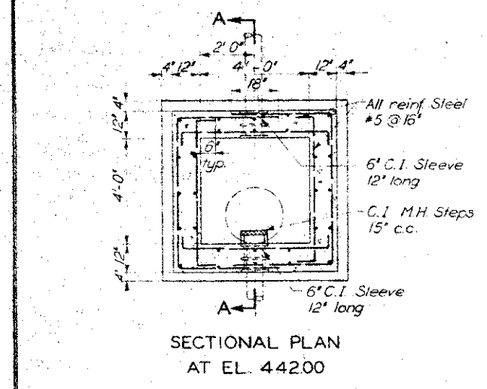


SECTION F - F



ELEVATION

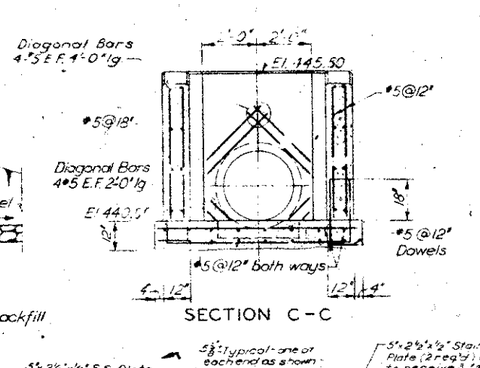
SPILLWAY SILL
SCALE: 1/2" = 1' - 0"



SECTIONAL PLAN AT EL. 442.00

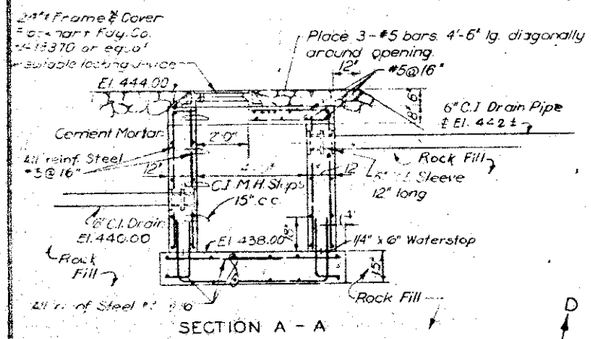
PLAN

SECTION B-B



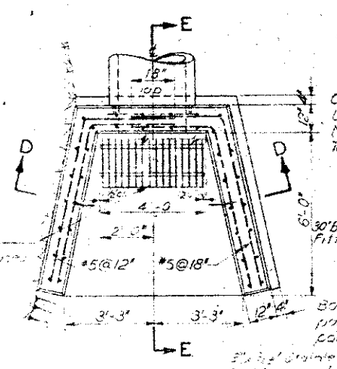
SECTION C-C

DIVERSION OUTLET STRUCTURE
SCALE: 3/8" = 1' - 0"
Work Done Under Contract No. 2

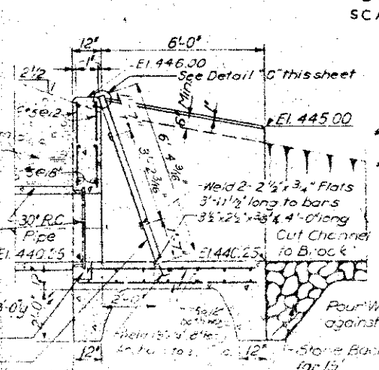


SECTION A - A

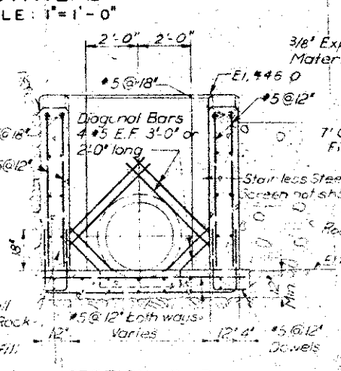
MANHOLE ON UNDERDRAIN
SCALE: 3/8" = 1' - 0"



PLAN

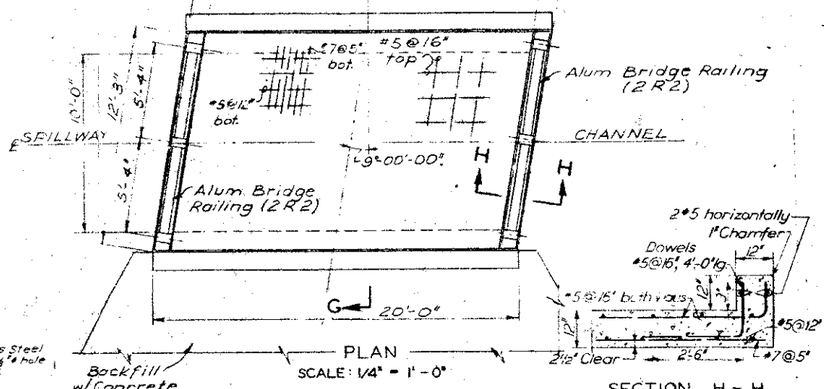


SECTION E-E



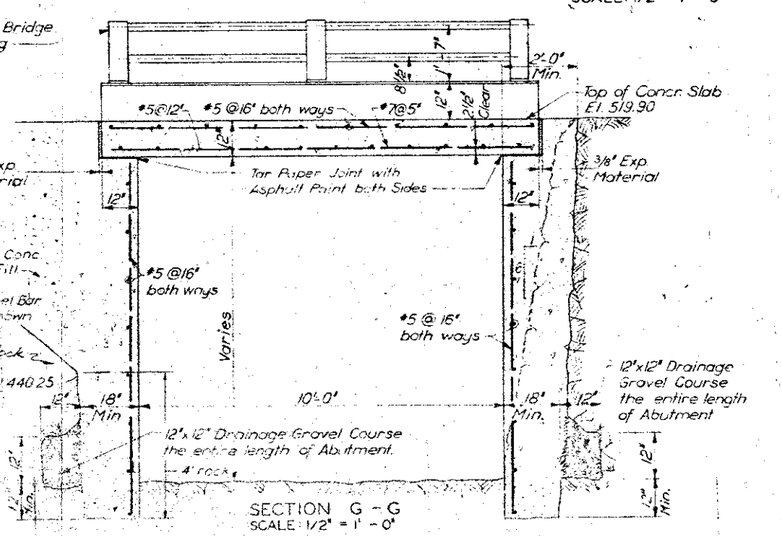
SECTION D-D

DIVERSION INLET STRUCTURE
SCALE: 3/8" = 1' - 0"



PLAN
SCALE: 1/4" = 1' - 0"

SECTION H - H
SCALE: 1/2" = 1' - 0"



SECTION G - G
SCALE: 1/2" = 1' - 0"

ACCESS ROAD BRIDGE OVER SPILLWAY CHANNEL

MALCOLM PIRNIE ENGINEERS
11 W. 43RD ST., NEW YORK, N.Y.

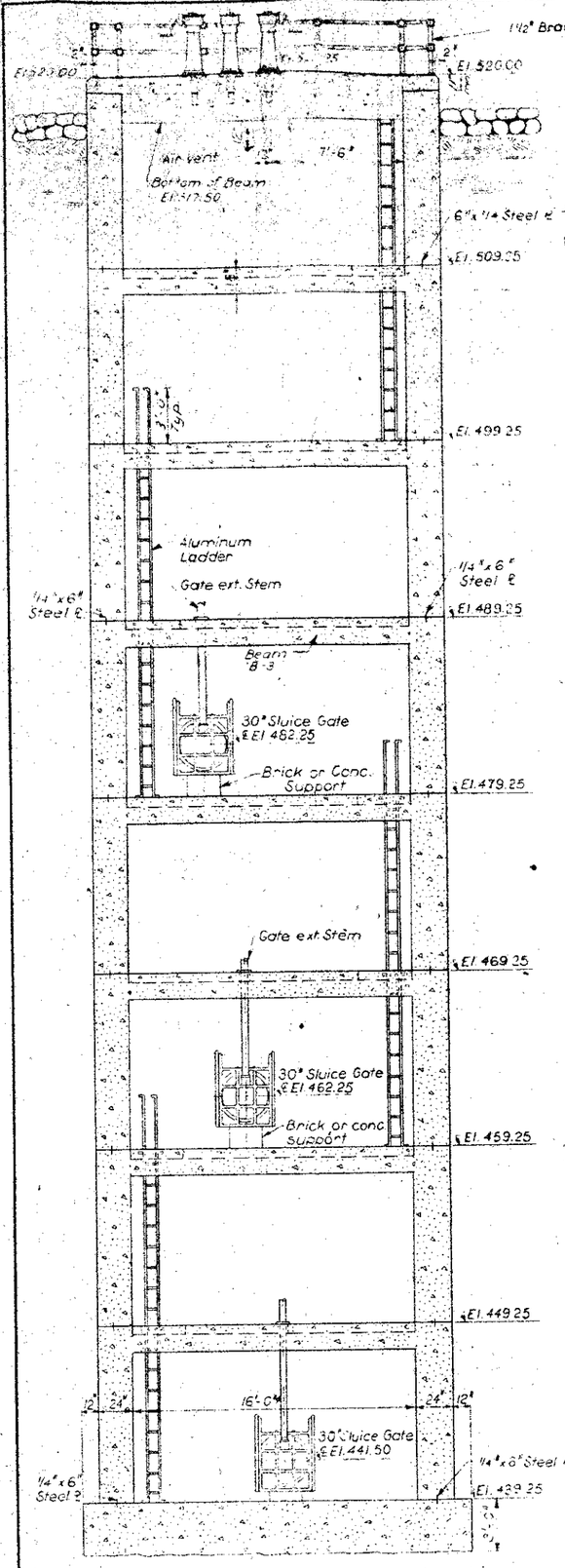
DESIGNED A.S. DRAWN J.B. CHECKED
REVISIONS: 4-5-65

CITY OF NEW BRITAIN, CONN.
PANTHER SWAMP PROJECT
CONTRACT NO. 1
PANTHER SWAMP DAM, ACCESS RD. & DIKE

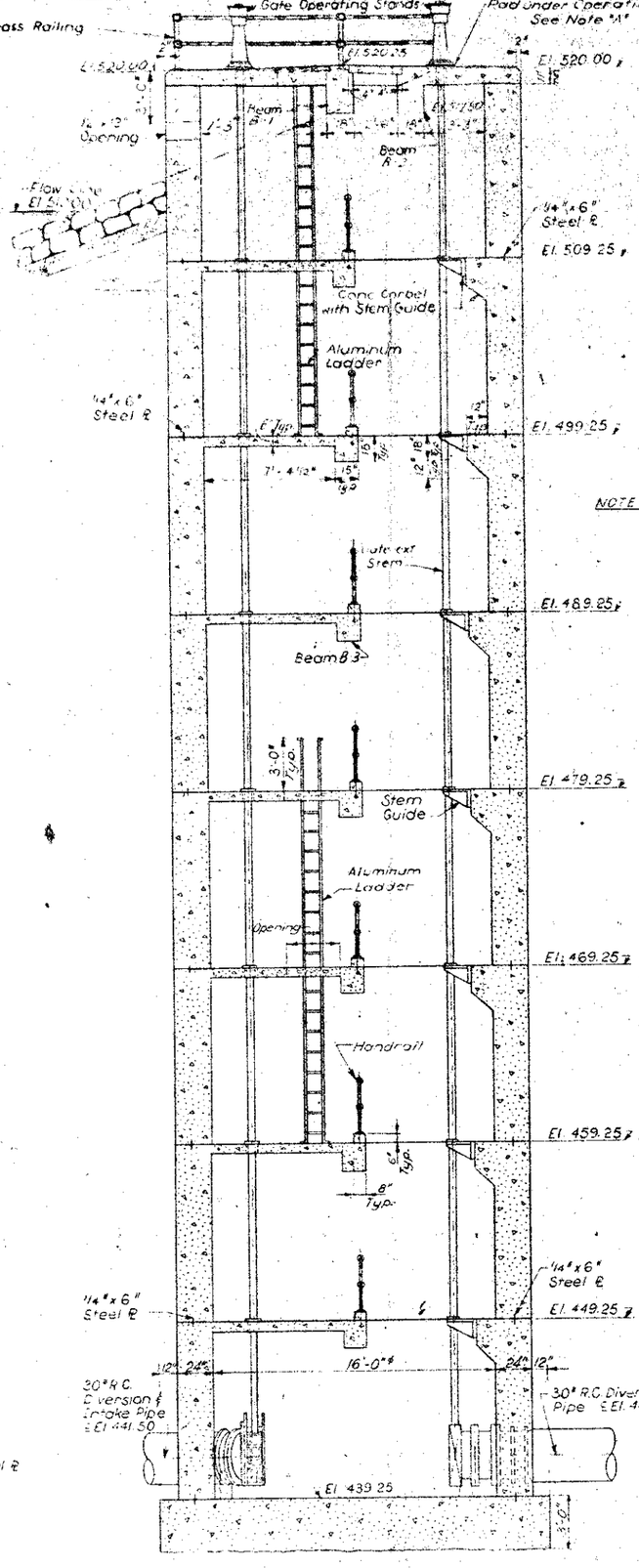
DAM
AS BUILT
SPILLWAY CHANNEL, BRIDGE AND DETAILS
SCALES AS INDICATED

DATE ANUARY 1966
SHEET 3 OF 9
DWG. NO. 338-61.003-1

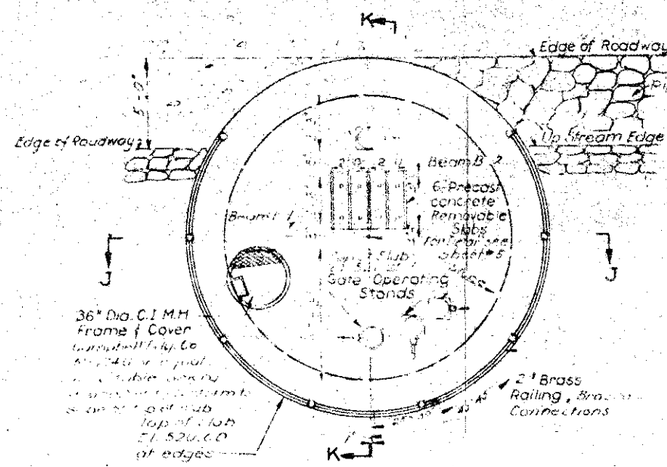
1208



SECTION J - J

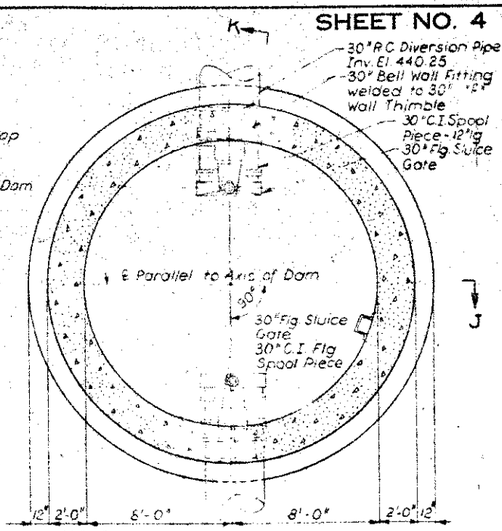


SECTION K - K



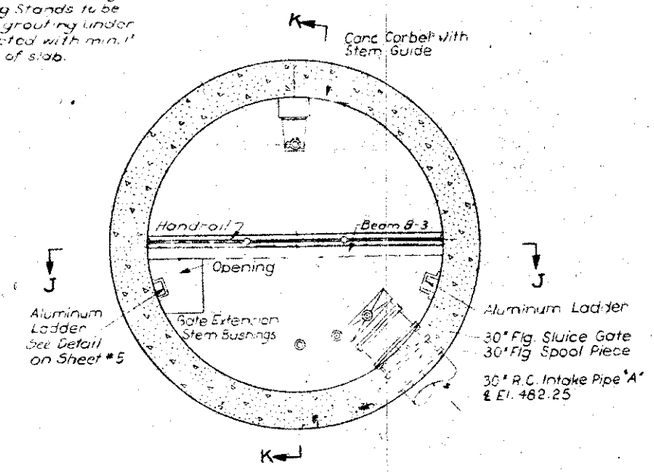
NOTE "A" Slope top slab from El. 520.25 at center to El. 520.00 at edges. Gate Operating Stands to be set plumb by grouting under bases as directed with min. ½" pad above top of slab.

OPERATING FLOOR PLAN

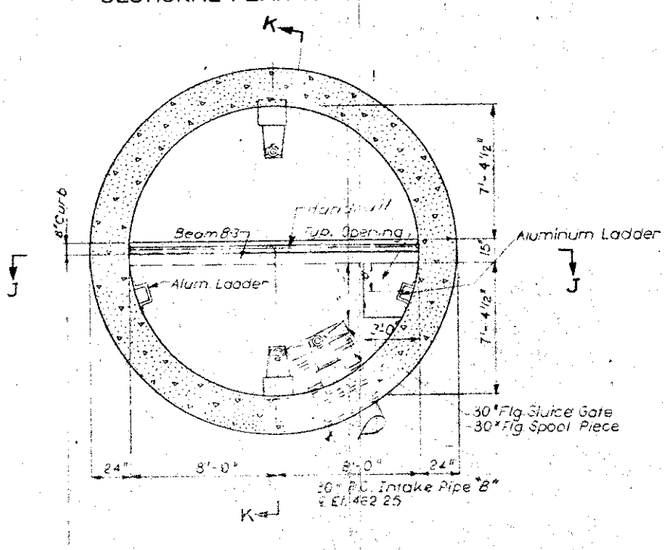


SECTIONAL PLAN AT EL. 446.00

Note Place in Wall for each 30" R.C. Pipe one "Bell" Wall Fitting welded to 30" "F" Wall Thimble.

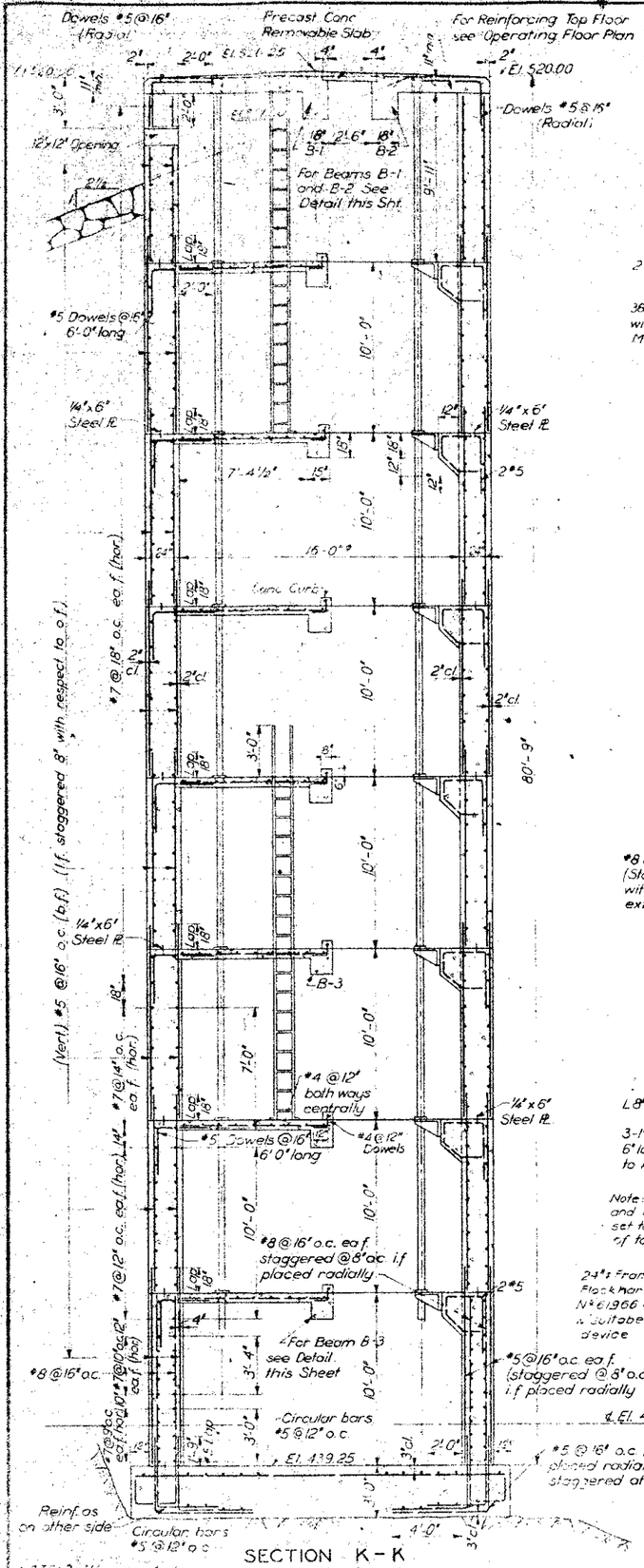


SECTIONAL PLAN AT EL. 486.00



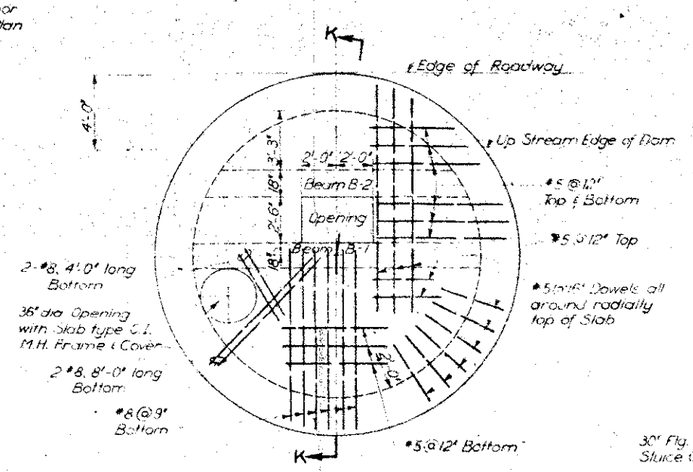
SECTIONAL PLAN AT EL. 466.00

MALCOLM PIRNIE ENGINEERS 25 W. 43RD ST., NEW YORK, N.Y.		DESIGNED A.S. DRAWN C.G. CHECKED REVISIONS: 4-5-65	CITY OF NEW BRITAIN, CONN. PANTHER SWAMP PROJECT CONTRACT NO. 1 PANTHER SWAMP DAM, ACCESS RD. & DIKE	DAM INTAKE TOWER PLANS AND SECTIONS SCALE 1/4"-1'-0"	DATE JANUARY 1965 SHEET 4 OF 9 DWG. NO 133B-61 004

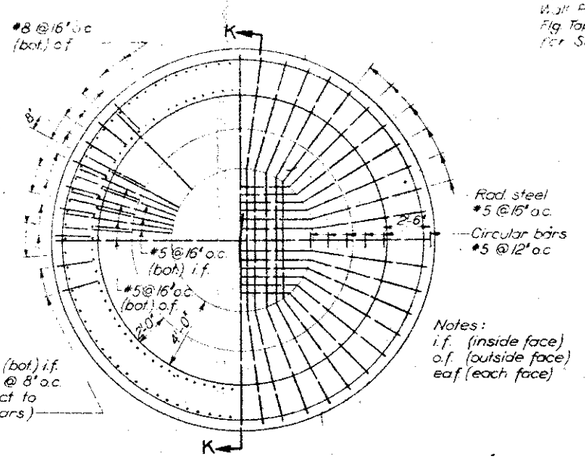


SECTION K-K
SCALE: 1/4" = 1'-0"

NOTE: Railings not shown. See Sheet No. 4.



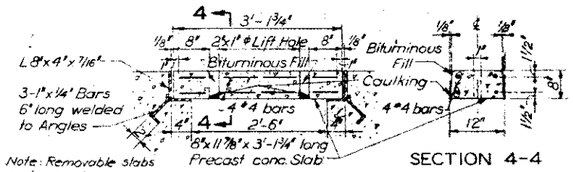
OPERATING FLOOR PLAN
SCALE: 1/4" = 1'-0"



BOT. STEEL (RAD. & CIRC.)

TOP STEEL (RAD. & CIRC.)

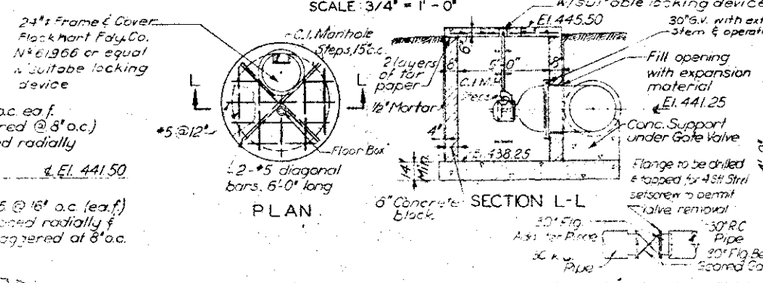
BOTTOM SLAB
SCALE: 1/4" = 1'-0"



SECTION 4-4

REMOVABLE SLAB DETAIL
4 REQUIRED
SCALE: 3/4" = 1'-0"

Note: Removable slabs and appurtenances to be set to conform to slope of top slab.



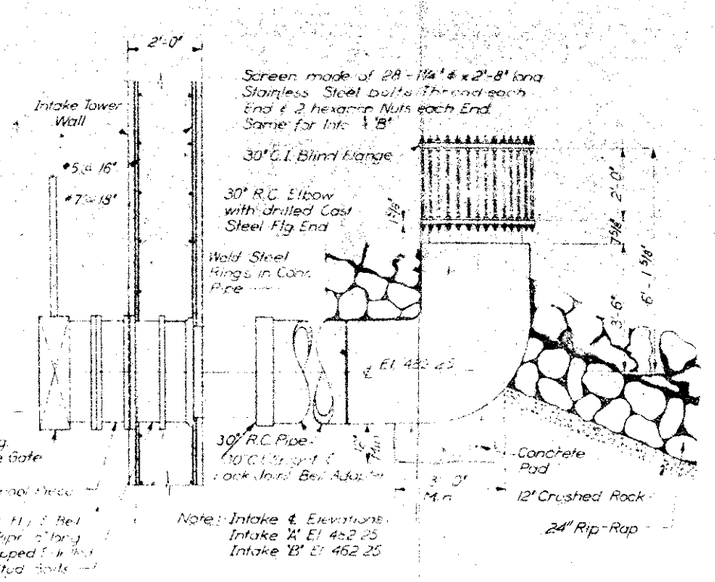
PLAN

SECTION L-L

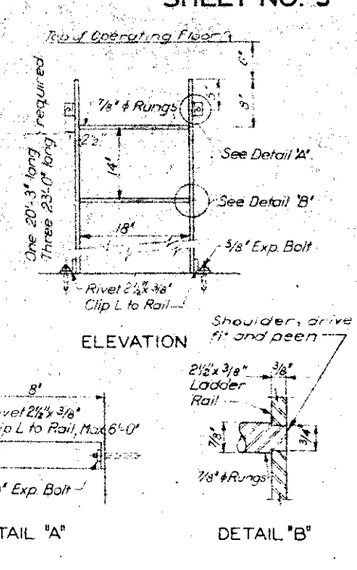
MANHOLE DETAIL
SCALE: 1/4" = 1'-0"

GATE CONNECTION DETAIL
NOT TO SCALE

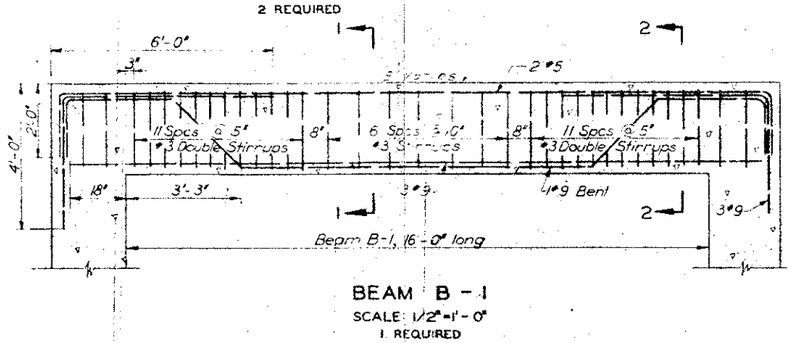
Work Done Under Contract No. 2



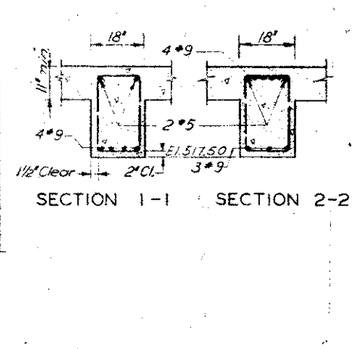
INTAKE "A" DETAIL
SCALE: 1/2" = 1'-0"
2 REQUIRED

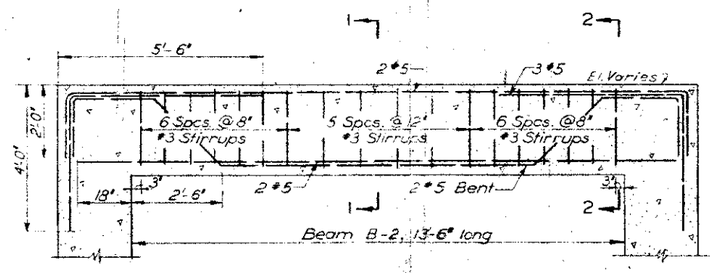


ALUMINUM LADDER DETAIL
SCALE: 1" = 1'-0"

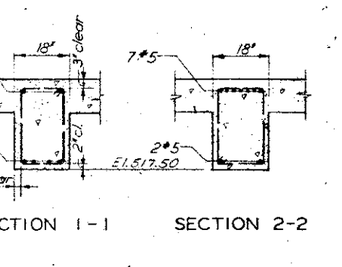


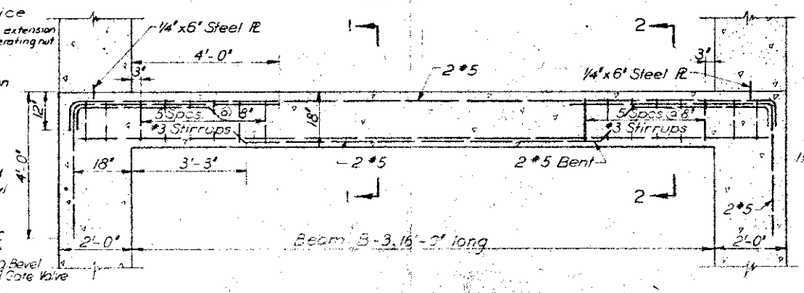
BEAM B-1
SCALE: 1/2" = 1'-0"
1 REQUIRED



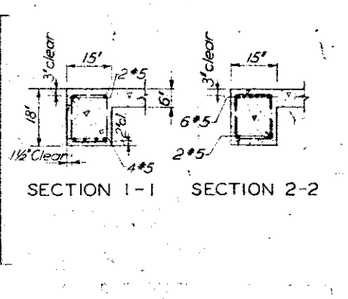


BEAM B-2
SCALE: 1/2" = 1'-0"
1 REQUIRED



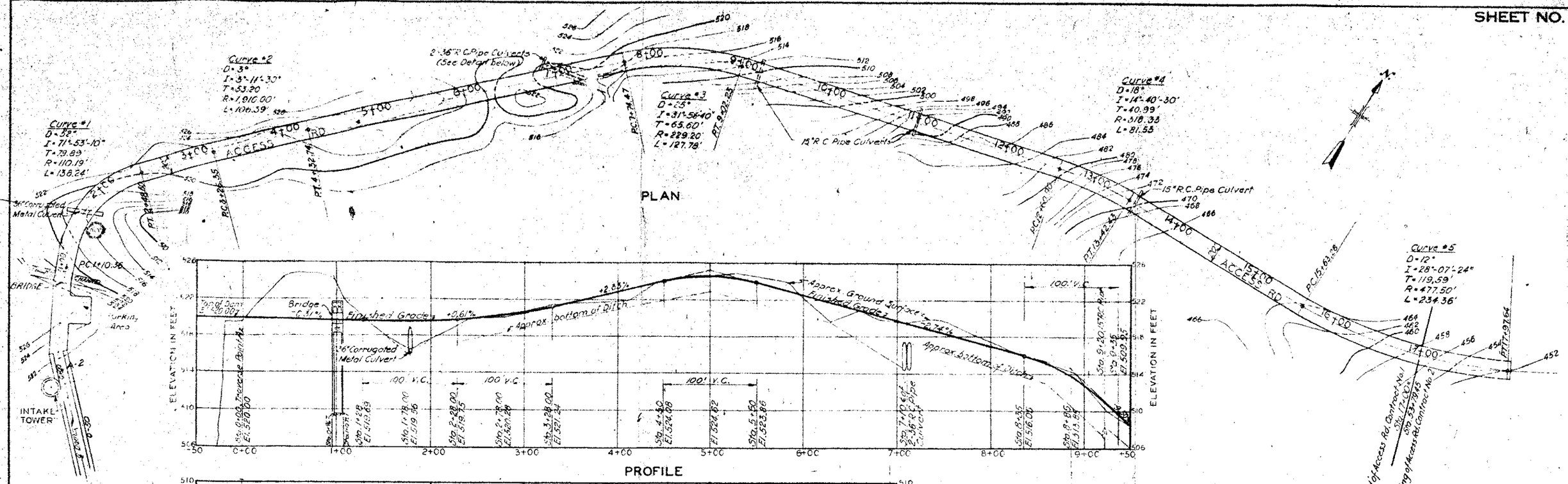


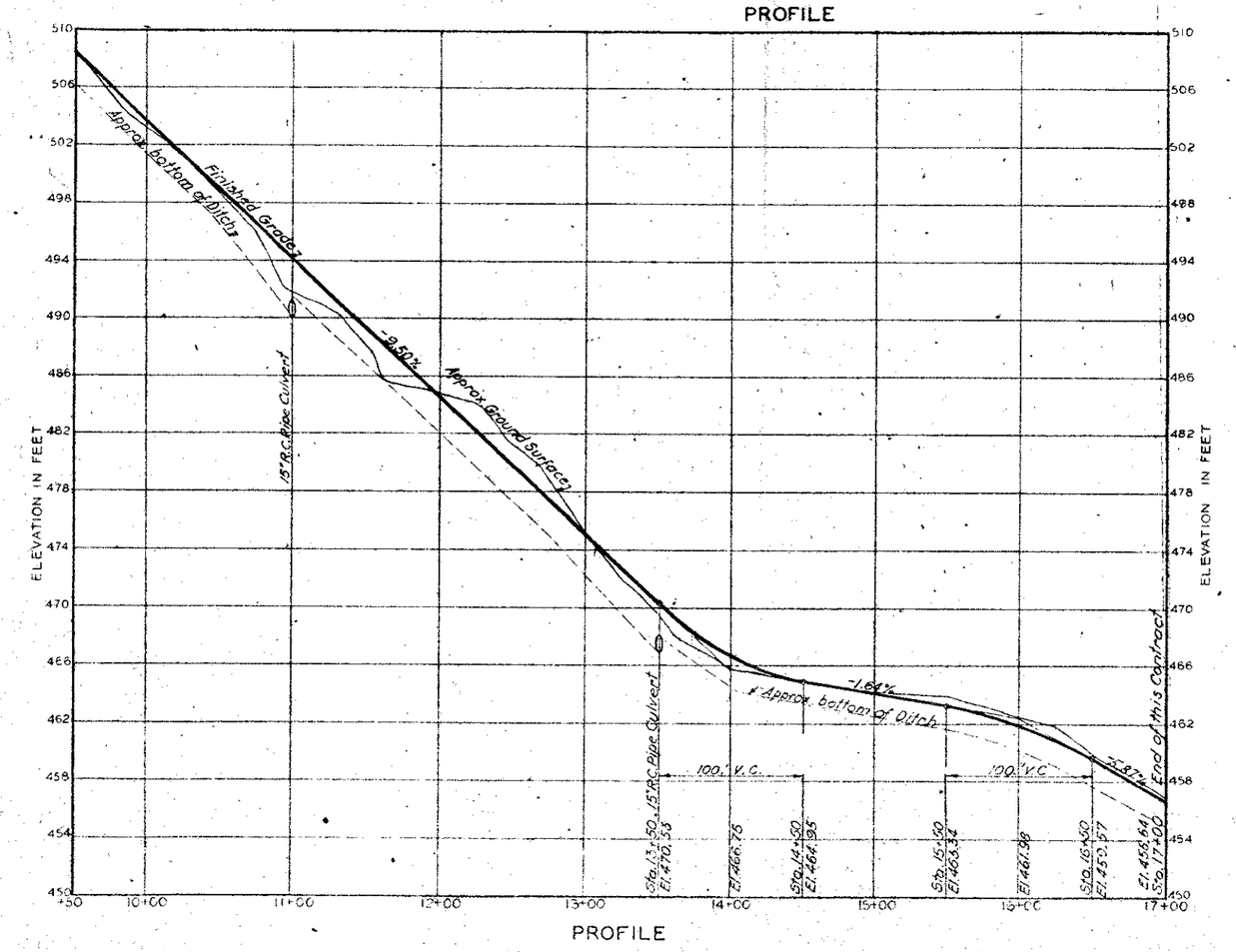
TYPICAL INTERMEDIATE BEAM DETAIL
SCALE: 1/2" = 1'-0"
7 REQUIRED

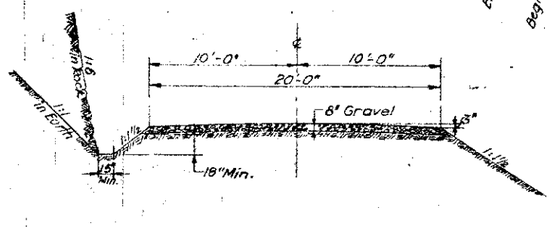


MALCOLM PIRNIE ENGINEERS 25 W. 43RD ST., NEW YORK, N.Y.		DESIGNED A.S. DRAWN J.B. CHECKED REVISIONS: 4-5-65	CITY OF NEW BRITAIN, CONN. PANTHER SWAMP PROJECT CONTRACT NO. 1 PANTHER SWAMP DAM, ACCESS RD. & DIKE	DAM INTAKE TOWER DETAILS SCALES AS INDICATED	DATE JANUARY 1965 SHEET 5 OF 9 DWG. NO. 133B-61.005-0

HP-08

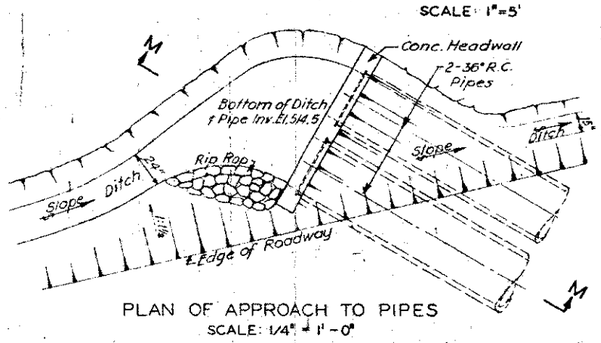






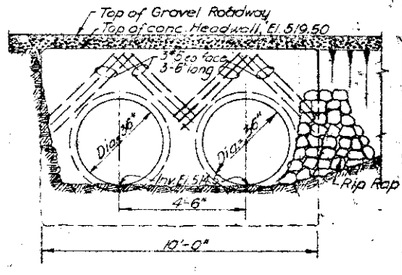
TYPICAL ROAD SECTION

SCALE: 1"=5'



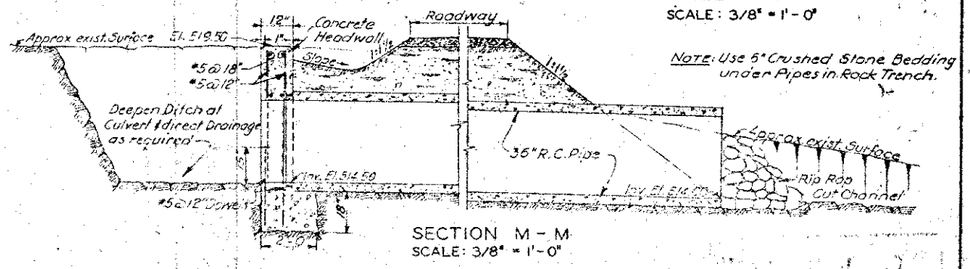
PLAN OF APPROACH TO PIPES

SCALE: 1/4" = 1'-0"



ELEVATION

SCALE: 3/8" = 1'-0"



NOTE: Use 6" Crushed Stone Bedding under Pipes in Rock Trench.

SECTION M - M

SCALE: 3/8" = 1'-0"

DOUBLE 36 INCH R.C. PIPE CULVERT

HEADWALL FOR SINGLE PIPE SIMILAR

MALCOLM PIRNIE ENGINEERS
25 W. 43RD ST., NEW YORK, N.Y.

DESIGNED A.S. DRAWN A.S. CHECKED

REVISIONS: 4-5-65

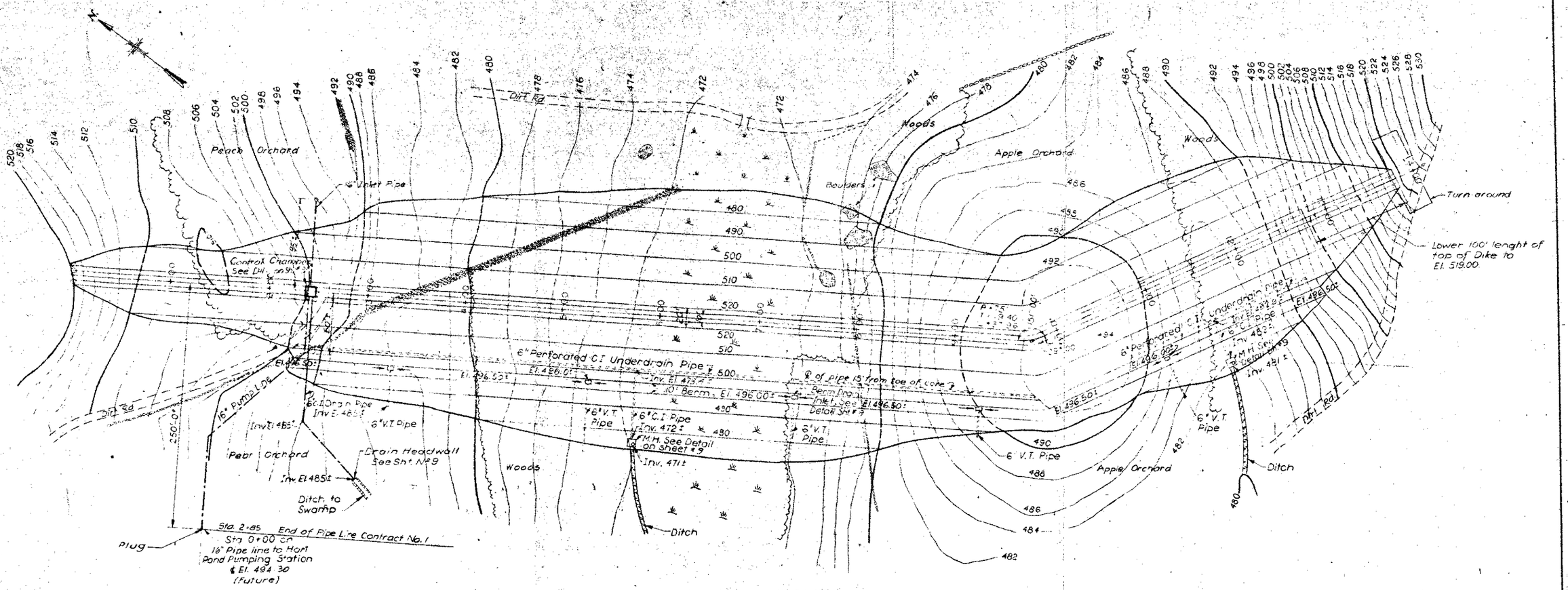
CITY OF NEW BRITAIN, CONN.
PANTHER SWAMP PROJECT
CONTRACT NO. 1
PANTHER SWAMP DAM, ACCESS RD. & DIKE

ACCESS ROAD
PLAN, PROFILE AND DETAILS
SCALES: HOR. 1"=50'-0" VERT 1"=5'-0" EXCEPT AS INDICATED

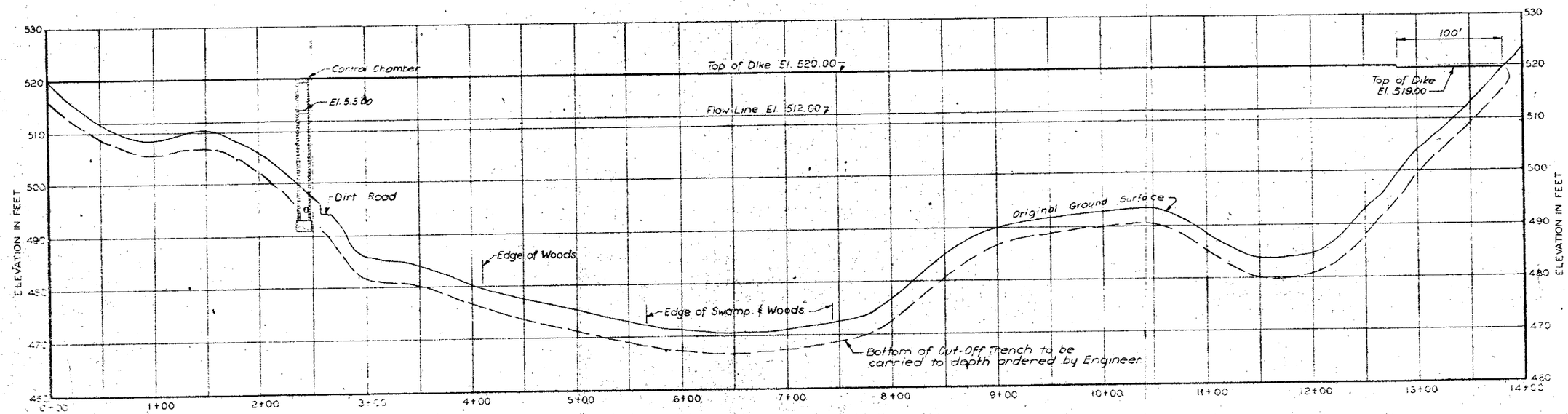
DATE JANUARY 1965

SHEET 6 OF 9

DWG. NO 1338-61006-6



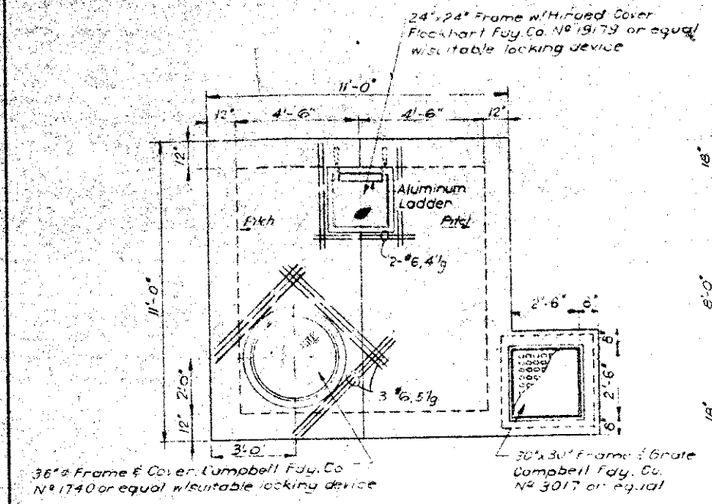
LOCATION PLAN OF DIKE
SCALE: 1"= 50'



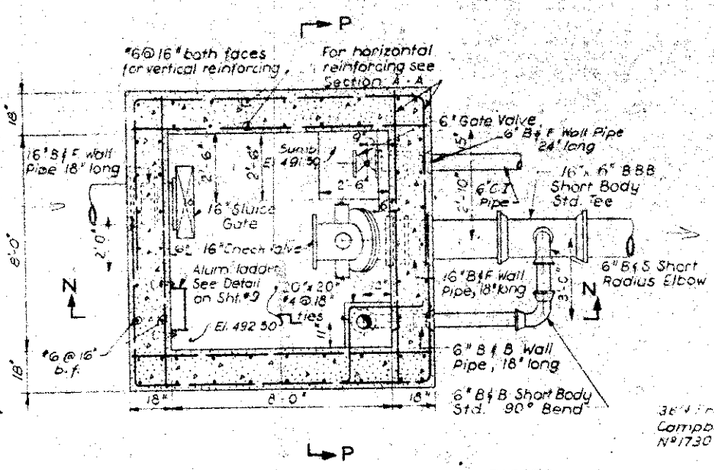
CENTERLINE PROFILE OF DIKE
SCALES: HOR. 1"= 50', VERT. 1" = 10'

MALCOLM PIRNIE ENGINEERS 125 W. 43rd ST., NEW YORK, N.Y.	Rev.	DESIGNED P. D. DRAWN C.G. CHECKED J.G. REVISIONS: 4-5-65	CITY OF NEW BRITAIN, CONN. PANTHER SWAMP PROJECT CONTRACT NO. 1 PANTHER SWAMP DAM, ACCESS RD. & DIKE	DIKE PLAN AND PROFILE SCALES AS INDICATED	DATE JANUARY 1965 SHEET 7 OF 9 DWG. NO. 133B-61.007-0

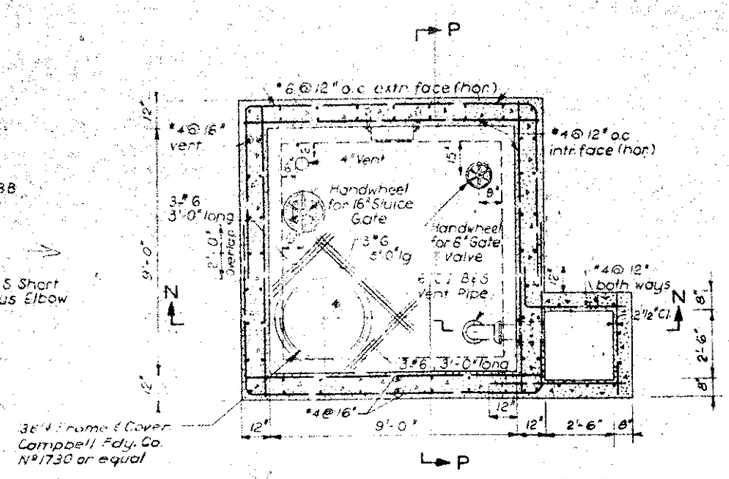
HP-08



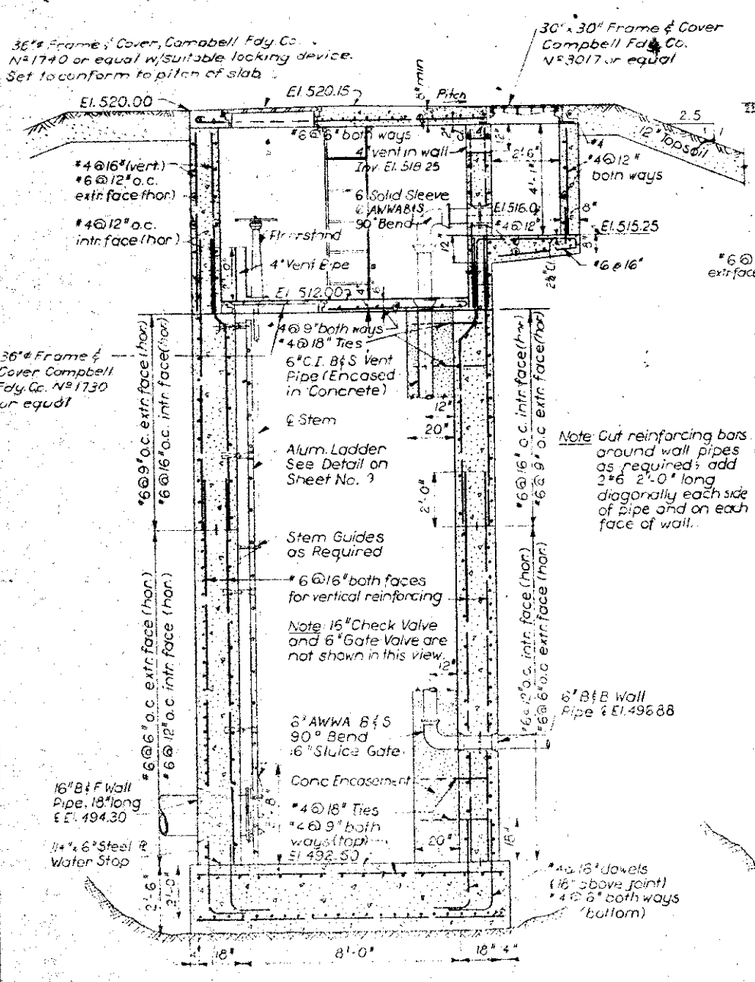
PLAN



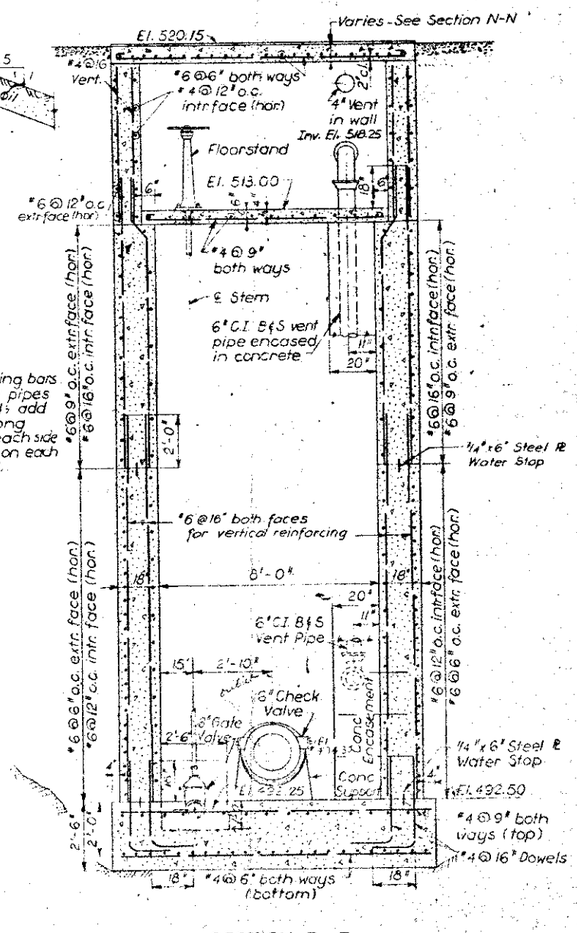
SECTIONAL PLAN BELOW EL. 513.00



SECTIONAL PLAN AT EL. 518.00



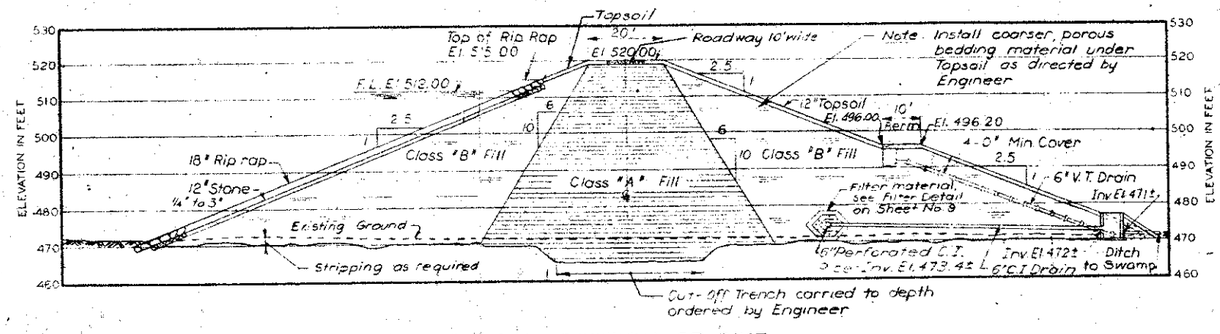
SECTION N-N



SECTION P-P

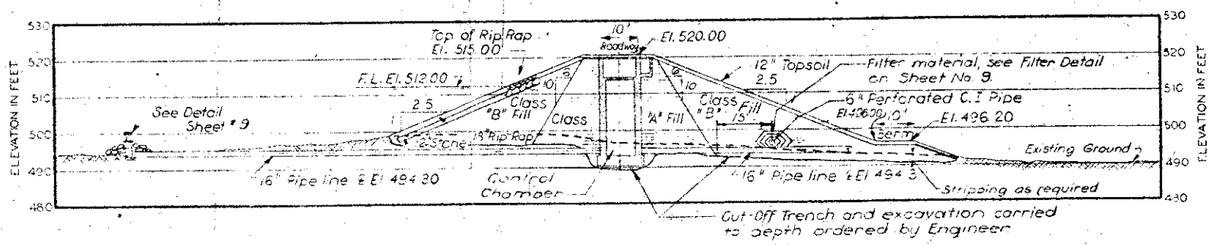
CONTROL CHAMBER

SCALE: 3/8" = 1'-0"



TYPICAL SECTION OF DIKE

SCALE: 1" = 20'

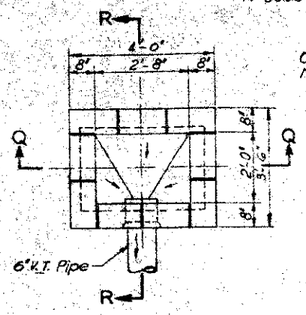


SECTION THROUGH CONTROL CHAMBER

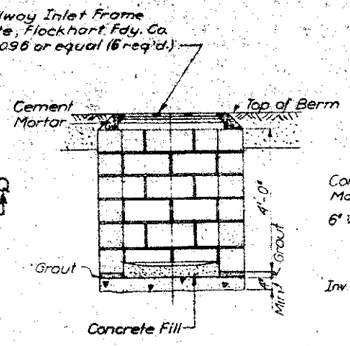
SCALE: 1" = 20'

MALCOLM PIRNIE ENGINEERS. 25 W. 43RD ST., NEW YORK, N.Y.	Plow	DESIGNED P.D. DRAWN C.G. CHECKED fjr REVISIONS: 4-5-65	CITY OF NEW BRITAIN, CONN. PANTHER SWAMP PROJECT CONTRACT NO. 1 PANTHER SWAMP DAM, ACCESS RD. & DIKE	CONTROL CHAMBER AND DIKE PLAN AND SECTIONS SCALES AS INDICATED	DATE JANUARY 1965 SHEET 8 OF 9 DWG. NO. 1338-61.008-D

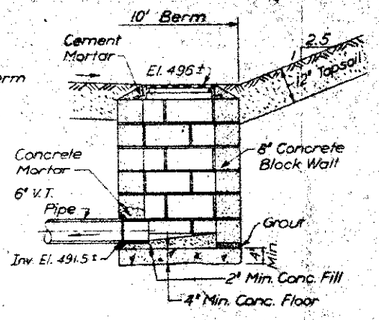
HP-08



PLAN



SECTION Q - Q

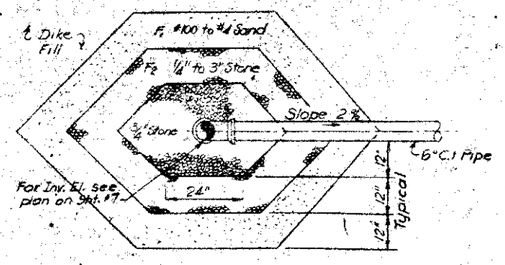


SECTION R - R

BERM DRAIN INLET DETAIL

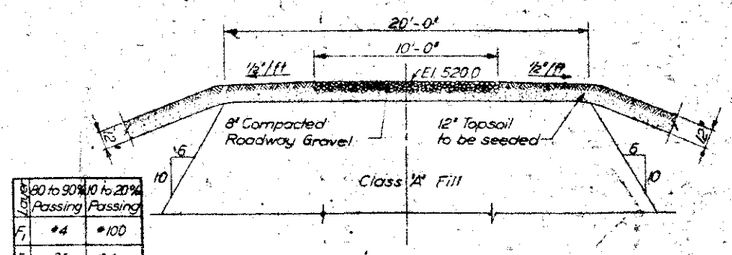
5 REQUIRED

SCALE: 1/2" = 1'-0"



DRAIN FILTER DETAIL

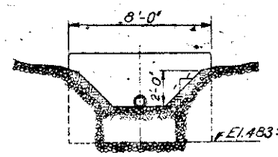
SCALE: 1/2" = 1'-0"



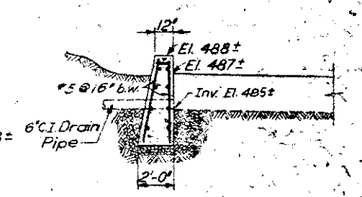
	80 to 90% Passing	10 to 20% Passing
F1	#4	#100
F2	3"	#4

TYPICAL ROAD SECTION ON DIKE

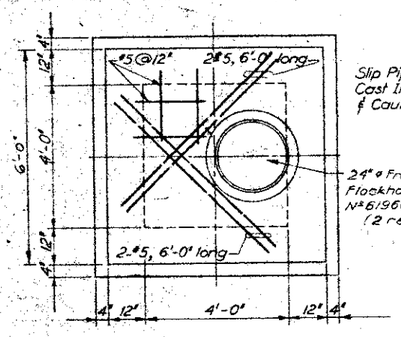
SCALE: 1/4" = 1'-0"



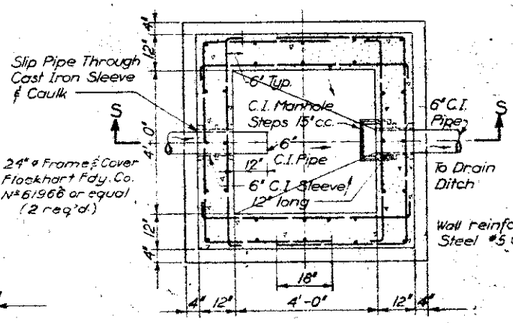
ELEVATION



SECTION T - T



PLAN

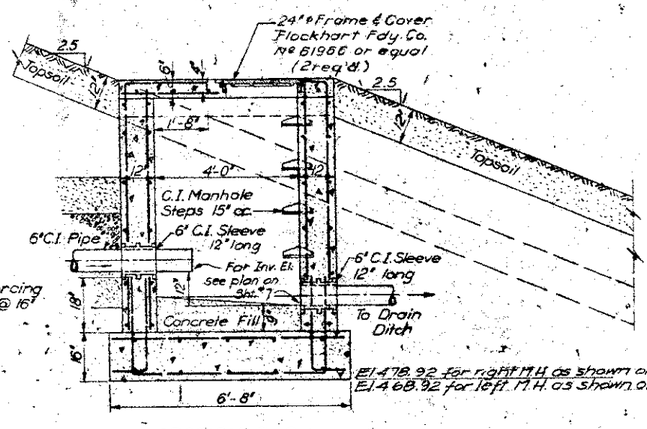


SECTIONAL PLAN

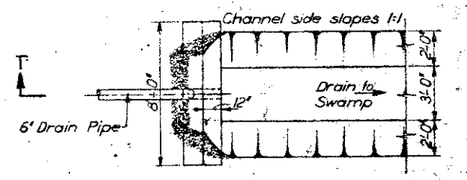
DRAIN MANHOLE

2 REQUIRED

SCALE: 1/2" = 1'-0"



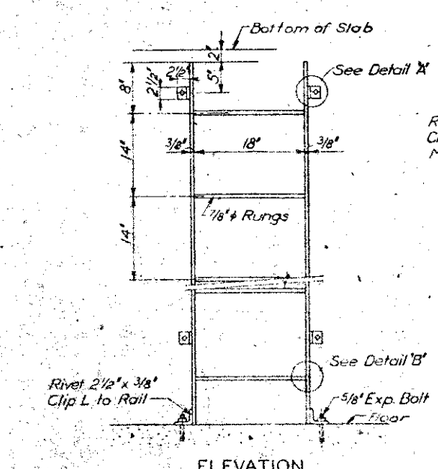
SECTION S - S



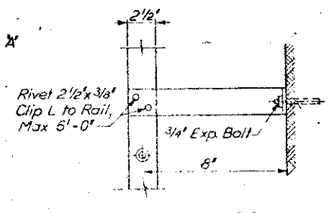
PLAN

DRAIN HEADWALL & CHANNEL DETAILS

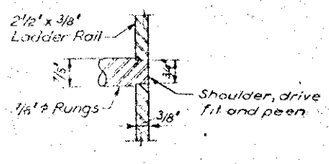
SCALE: 1/4" = 1'-0"



ELEVATION



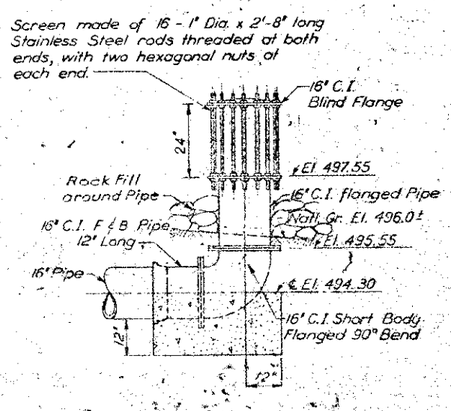
DETAIL 'A'



DETAIL 'B'

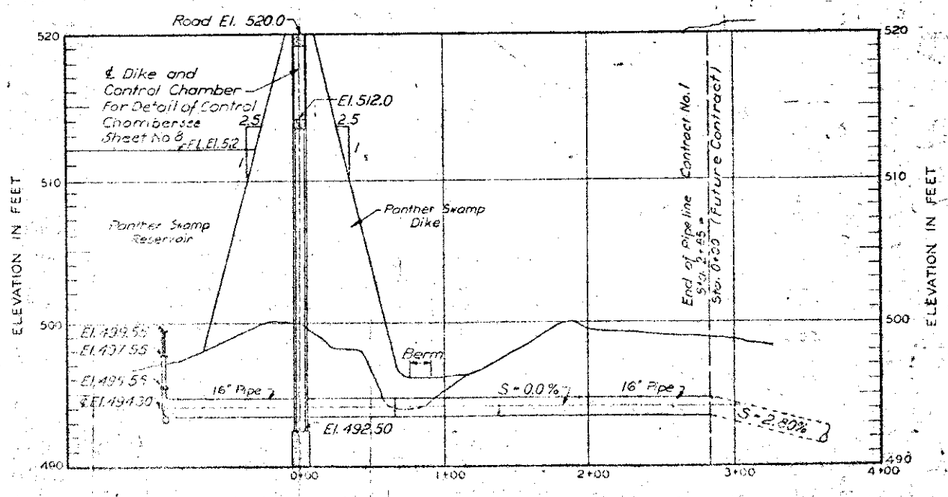
ALUMINUM LADDER DETAIL

SCALE: 1" = 1'-0"



INLET SCREEN DETAIL

SCALE: 1/2" = 1'-0"



PROFILE OF 16" PUMPLINE AT DIKE

SCALES: HOR. 1" = 50'
VER. 1" = 5'

AS BUILT

MALCOLM PIRNIE ENGINEERS 25 W. 43RD ST., NEW YORK, N.Y.		DESIGNED P.D. DRAWN J.B. CHECKED REVISIONS: 4 - 5 - 65	CITY OF NEW BRITAIN, CONN. PANTHER SWAMP PROJECT CONTRACT NO. 1 PANTHER SWAMP DAM, ACCESS RD. & DIKE	DIKE DETAILS SCALES AS INDICATED	DATE JANUARY 1965 SHEET 9 OF 9 DWG. NO. 1338-61.009-0

HP-08

IACCHI & HOFFMAN • ENGINEERS

(ECUTIVE OFFICES • 44 GILLETT STREET • HARTFORD, CONN., 06105 • PHONE (203) 549-6190

J. MACCHI, P.E.
)SE H. COSIO, P.E.
CHAEL GIRARD, P.E.

SOCIATE CONSULTANT
ROF. C. W. DUNHAM

April 4, 1973

State of Connecticut
Department of Environmental Protection
Water Resources Commission
165 Capitol Avenue
Hartford, Connecticut

Attention: Mr. V. Galgowsky

Re: Panther Swamp Dike
New Britain, Conn.

Gentlemen:

On Wednesday, April 4, 1973, A. J. Macchi and Jose H. Cosio inspected the above-referenced earth dike.

The underdrainage system appears to be working properly and clean water was flowing from both outlets of the system at the time of the inspection.

The downstream face of the dike does not show any signs of sloughing. The upstream rip rapped face of the dike appears to be in excellent condition.

Very truly yours,

MACCHI & HOFFMAN, ENGINEERS

Jose H. Cosio

JOSE H. COSIO, P.E.
CHIEF ENGINEER

vmc

A. J. MACCHI • ENGINEERS

EXECUTIVE OFFICES • 44 GILLETT STREET • HARTFORD, CONN., 06105 • PHONE 525-6631

A. J. MACCHI
H. R. HOFFMAN
J. J. SCHMID

ASSOCIATE CONSULTANT
PROF. C. W. DUNHAM

May 8, 1968

State of Connecticut
Water Resources Commission
165 Capitol Avenue
Hartford, Connecticut

Attention William H. O'Brien, III

Re: Panther Swamp Dam & Dike
New Britain Water System

Gentlemen:

As authorized by your letter of May 6, 1968, on Friday, April 26, 1968, I inspected the downstream face of the dike.

Dike (a 60 foot earth dam) was found to be very wet at the downstream toe in several areas, indicating extensive seepage. Because of the high fine content in the earth material used to construct the dam, I think the design engineers should be informed of this condition.

I have telephoned Ernest Whitlock of Malcolm Pirnie, Engineers, who said he will make an inspection and send me a letter stating his opinion regarding this matter.

Very truly yours,

A. J. MACCHI, ENGINEERS

A. J. MACCHI

MALCOLM PIRNIE ENGINEERS
Consulting Civil and Sanitary Engineers
OFFICE PARK
226 WESTCHESTER AVENUE
WHITE PLAINS, N. Y. 10604
914-428-1000

OLM PIRNIE
99-1967)
ST W WHITLOCK
RT D. MITCHELL
A. ARENANDER
OLM PIRNIE, JR.
ED C. LEONARD
I H. FOSTER
ETH W HENDERSON
IERT B. WYNDHAM, JR.

ROALD J. HAESTAD
HAROLD KESSLER
SAMUEL J. NAJARIAN
MARCUS L. O'SULLIVAN
THOMAS C. AULITA
PAUL L. BUSCH
ROBERT J. OLESEN
HORTON WASSERMAN
WILLIAM J. STEIN
GARRET P. WESTERHOFF
JOHN B. ZONDORAK

May 7, 1968

Mr. A. J. Macchi
44 Gillett Street
Hartford, Connecticut 06105

Dear Mr. Macchi:

Re: Panther Swamp Reservoir

In accordance with our telephone conversation last week, we made a thorough inspection of the dike and dam at the Panther Swamp Reservoir on May 7th. There was no evidence of seepage through the earth embankments and no indication of movement of surface material on any part of the downstream slopes.

The westerly outlet of the underdrain system of the dike was discharging water. The end of the outlet pipe is below groundwater and not visible. The boil you mentioned was caused by water and air discharging from the outlet pipe some distance from the outlet manhole.

As expected, the increased elevation of the reservoir water, as it has filled, has raised the groundwater level south of the toe of the dike, and has caused a wet condition at the surface of the natural ground some distance away from the downstream toe. We expect the wet areas of the natural ground south of the dike will be reduced as groundwater levels in the general vicinity of the dam become lower within the next few months.

We will make another inspection of the dike and dam within two or three weeks when it is expected that the reservoir will be completely filled, and will inform you in writing on the results of this inspection.

Very truly yours,

Ernest W. Whitlock

EWW/ck
cc: Messrs. D. Naples,
A. Tomasso

A. J. MACCHI • ENGINEERS
14 GILLETT STREET PHONE 525-6631 HARTFORD, CONN.

MEMORANDUM

May 8, 1967

Re: Panther Swamp Dam
New Britain, Conn.

Inspected the above dam on May 5, 1967 in particular to check the downstream face of dike for sluffing as may have resulted from Spring thaw.

There was no heavy frost this winter so the problem of sluffing embankments due to unequal thaw did not receive a good test. This problem for which I have some concern is better understood by reviewing correspondence starting with my letter of January 10, 1966 to Malcolm Pirnie, Engineers, which is enclosed along with our complete file on this project.

As stated in the letter of October 24 and November 10, 1966 from Malcolm Pirnie, Engineers to New Britain Water Commission, this dam and dike are to be inspected annually in the Spring after the ground has thawed by a competent engineer, to check on the stability of the downstream face of the dike. A copy of the report resulting from this inspection should be sent to the State Water Resources Commission.

I recommend this project be accepted on these conditions.

A. J. MACCHI, ENGINEERS

A. J. MACCHI

Encl.

March 8, 1966

Malcolm Pirnie Engineers
522 Fifth Avenue
New York, N. Y. 10036

Attention: Mr. R. D. Mitchell

RE: PANTHER SWAMP DIKE
CITY OF NEW BRITAIN, CONN.

Gentlemen:

In accordance with your request, we have reviewed the plans and specifications for the Panther Swamp Dike which is part of the Panther Swamp Project for the City of New Britain, Conn. The writer inspected the conditions of the dike in the field on Sunday, March 6, 1966. At the time of the inspection the dike had apparently been completed to final grades but the riprap surfacing for the upstream face had not been placed and the topsoil cover for the downstream face was yet to be applied. Particular attention was given to your proposal to protect the downstream face of the dike with a topsoil and sod cover and any difficulties that might result from this form of downstream slope protection.

The weathered shale materials used for construction of this dike are an excellent material for embankment construction, are well-graded from large gravel through clay sizes, should compact well in the field and result in a highly impervious embankment. The appearance of the dike in the field confirms this evaluation of the materials. The dike appears to be well-built and there is no sign of surface erosion on the faces of the embankment in spite of the snow run-off and heavy rains of the last few weeks.

In our opinion, your provision of an inverted filter and drain under the downstream section of the dike is adequate to control seepage through the dike and to assure the safety and stability of the dike. Due to the relatively small dimensions of the drainage pocket, it is possible that a minor quantity of seepage may bypass the drain and

find its way to the downstream toe of the dike, particularly at the abutments and at the high ground near the southeast end of the dike where the drain is interrupted. It is probable that the effects of such seepage, if it does occur, will not be observable until several years after the reservoir is placed in use.

In regard to the downstream face of the dike, it is our opinion that the internal drain you have provided will effectively prevent outcropping of seepage at all points on the downstream face except possibly at the lowest portions of the downstream toe. Therefore, seepage as affecting the surface protection of the downstream face is not a problem. We believe that the embankment fill provides an excellent surface on which to place a topsoil and turf cover directly and that such a cover should perform at least as well or better than the turf covers placed on comparable highway embankments. The berm and surface drains you have placed on the downstream face seem to us to be adequate to control the effects of surface run-off on the downstream face after the turf cover is established.

In conclusion, we recommend that the topsoil and turf cover for the downstream face of the dike be used as shown on your drawings and provided for in your specifications but that you advise the owner to inspect the downstream toe of the dike at intervals over the years after the reservoir is placed in service in order to detect any possible softening and sloughing of the cover at the toe. If such effects are observed, we would recommend that the topsoil cover be stripped from the areas affected and that these areas be covered by a sand and gravel filter layer and a small rockfill toe extending a short distance beyond the present dike outline. We believe that the need for such measures is not probable and that simple and economical corrections can be made if the need does occur. We assume, of course, that the topsoil cover on the downstream face of the dike will not be attempted until all frost is out of the ground and the surface of the dike has dried to a stable condition such as existed at the completion of the embankment construction.

If you have further questions concerning our review of this design and construction, we will be glad to answer them as you may request. We are returning herewith the copy of the specifications for this project that you loaned to us for the purposes of our review.

Very truly yours,

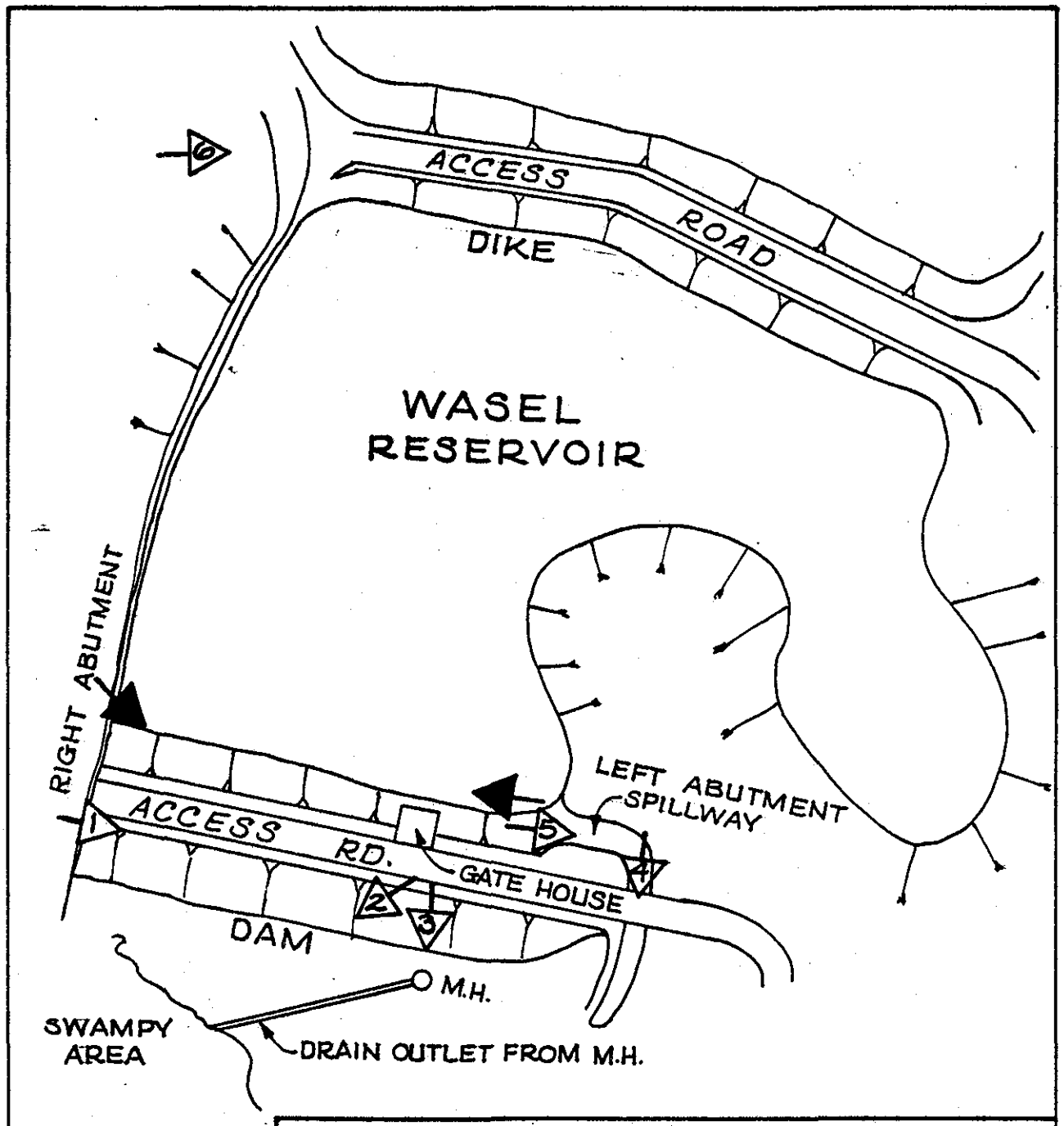
MUESER, RUTLEDGE, WENTWORTH & JOHNSTON

By_____
Philip C. Rutledge

PCR:hc
encl

APPENDIX C

SELECTED PHOTOGRAPHS



Appendix 'C' Photos →

Overview Photos →

LOUIS BERGER & ASSOC., INC WELLESLEY, MASS. ARCHITECT ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

WASEL RESERVOIR DAM

SKETCH PLAN SHOWING LOCATION ORIENTATION OF PHOTOS

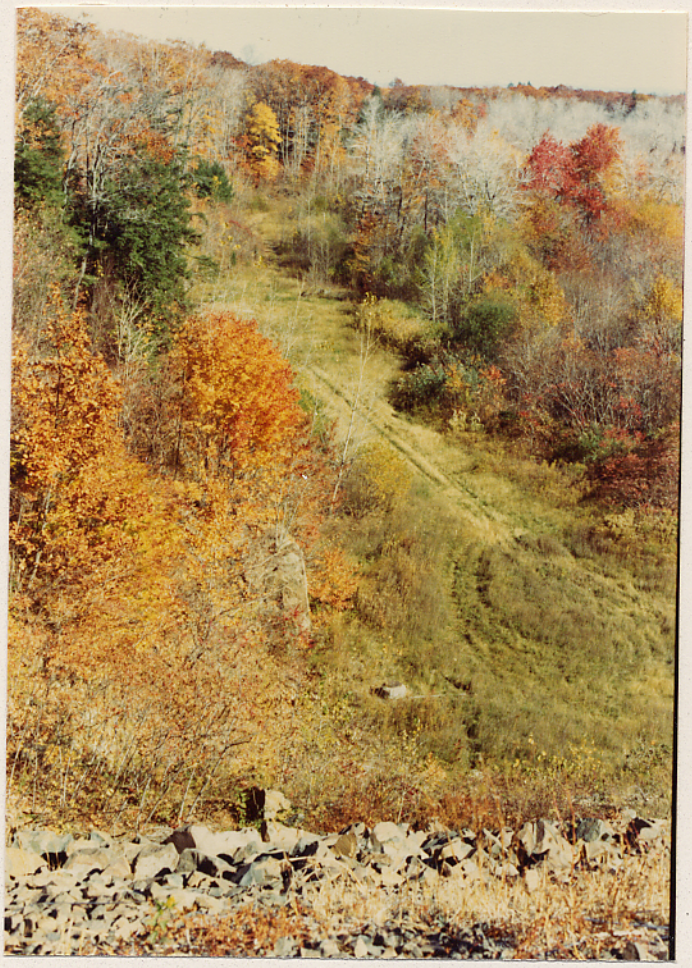
STATE - CT.

SCALE	1:24000
DATE	

WASEL RESERVOIR DAM

1. Downstream slope of main dam from right abutment

2. Pool of water below downstream toe of main dam



3. Downstream valley from main dam, showing manhole

4. Access road bridge across spillway outlet channel

5. Spillway approach channel & concrete sill

6. Overview of south dike from left abutment

APPENDIX D

HYDROLOGIC & HYDRAULIC COMPUTATIONS

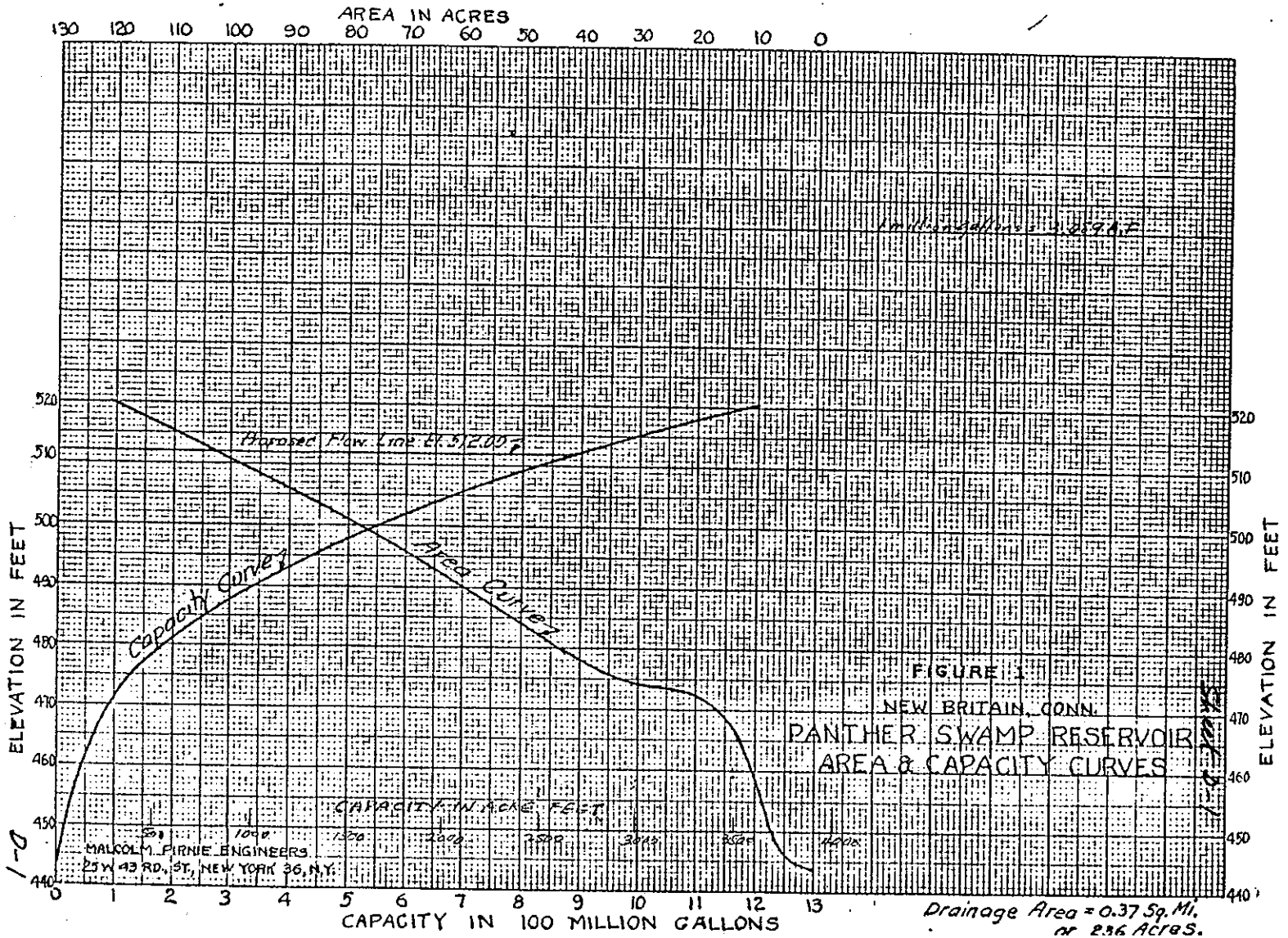


FIGURE 1

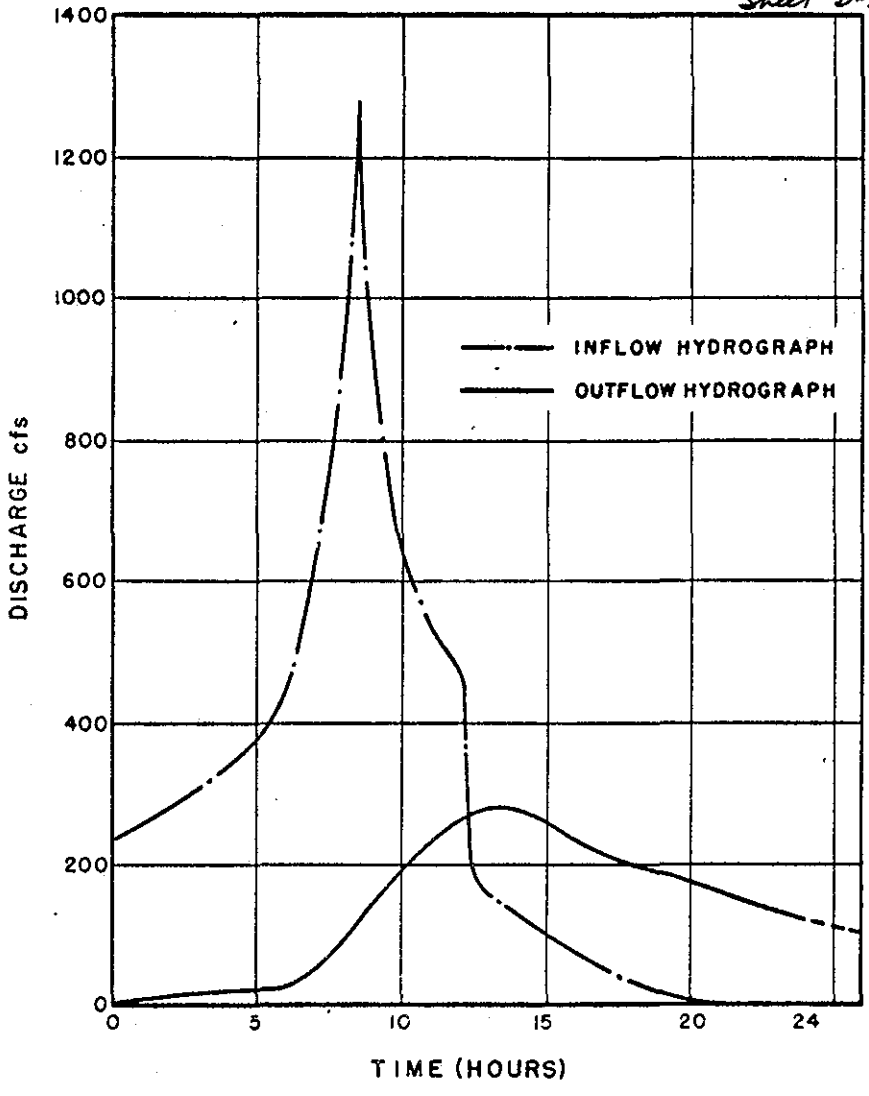
NEW BRITAIN, CONN.

PANTHER SWAMP RESERVOIR

AREA & CAPACITY CURVES

FIGURE 2

Sheet D-2



WASEL DAM

PANTHER SWAMP RESERVOIR

NEW BRITAIN, CONN.

SPILLWAY FLOOD DESIGN STUDIES

1 sq in = 82.64 A.F. A = 6.950" = 574 AF $\frac{5.74}{246} \times 12 = .28"$

D-2

NEW BRITAIN, CONNECTICUT

PANTHER SWAMP PROJECT

MEMORANDUM ON SPILLWAY DESIGN

February 1965

The Panther Swamp Reservoir has the following characteristics:

Drainage Area	0.37 sq. mi. = 240± acres
Surface Area	0.16 sq. mi. = 103± "

Spillway Crest

Elevation	512.00
Crest Length	10 feet
Top of Dam Elevation	520.00

Area Capacity Curve attached as Figure 1

Rainfall and runoff were investigated as follows:

1. U. S. Weather Bureau Hydrometerlogical Report No. 23 indicates maximum possible 24-hour precipitation of 28.5 inches. This represents a volume of 230 million gallons on the 0.37 square mile watershed and assuming no water losses and no outflow will fill the reservoir from spillway Elevation 512 to Elevation ~~518~~ 517. — 52.4 a.f. / 183 million gal

2. An inflow hydrograph was constructed based on a 12-hour storm totalling 28 inches (maximum 12-hour storm as shown on U. S. Weather Bureau Report No. 23). This hydrograph is shown on Figure 2. It peaks in about 8.4 hours, with a maximum inflow,

including rainfall on the reservoir, of 1,280 cfs. The storm was routed through the reservoir using various spillway lengths and a length of 10 feet was selected as applicable. With this length, the outflow hydrograph shown on Figure 2 was obtained. The outflow hydrograph peaks about 14 hours after the start of the storm, with an outflow of 275 cfs and a reservoir elevation of 515.7, leaving 4.3 feet freeboard.

3. The runoff characteristics were examined using the formula developed in U. S. G. S. Circular 365, "A Flood Flow Formula for Connecticut". Application of this formula results in an estimated mean annual flood of about 50 cfs. The maximum Connecticut floods of 1955 were of the magnitude of 7 times the mean annual floods. The peak flow indicated by this formula is 350 cfs, which is considerably less than that obtained from the rainfall-runoff procedure.

The above considerations indicate that use of the rainfall-runoff procedure results in a very conservative spillway design, and that the 10-foot spillway length is ample for any conceivable condition.

WASEL RESERVOIR

Spillway situated at North Dam

Drainage area 246 acres = 0.385 sq. mi.
Reservoir area at Normal W.S. El. 512 = 103 acres.
Reservoir storage at W.S. Elev. 512 = 2700 A.F.

Elev.	Res. Surface Area-Acres	Average area	Δ Stor. AF	Total Storage	Surcharg Storage A.F	Spillway Disch. cfs	Remarks
512	103			2700	0	0	Spillway crest
513	105	104	104	2804	104	32	
514	107	106	106	2910	210	92	
515	109	108	108	3018	318	175	
516	111	110	110	3128	428	273	
517	113	112	112	3240	540	388	
518	115	114	114	3354	654	517	
519	117	116	116	3470	770	661	
520	120	118	118	3588	888	821	Top. of Dam.

FLOOD ROUTING

For 24" PMP - No fit reduction.

Total runoff = $\frac{24 \times 246}{2}$ = 492 A.F

With no outflow from reservoir - Surcharge = $\frac{492}{112}$ = 4.39'

For 4.39' Head Q = 320 - Average 160 cfs.

In 12 hrs Outflow = 160 A.F.

For 0.5 PMF Total runoff = $\frac{492}{2}$ = 246 AF

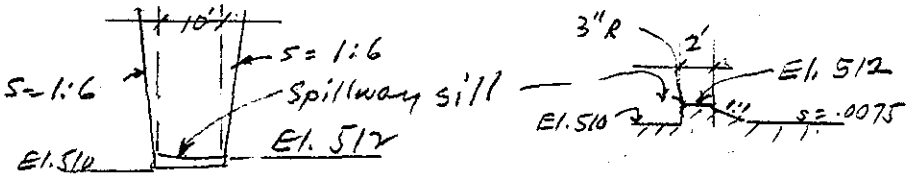
With no outflow from reservoir Surcharge = $\frac{246}{\pm 106}$ = 2.32'

Spillway Q = ± 120 cfs.

BY. DH DATE 10-20-78 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. D-6 OF...

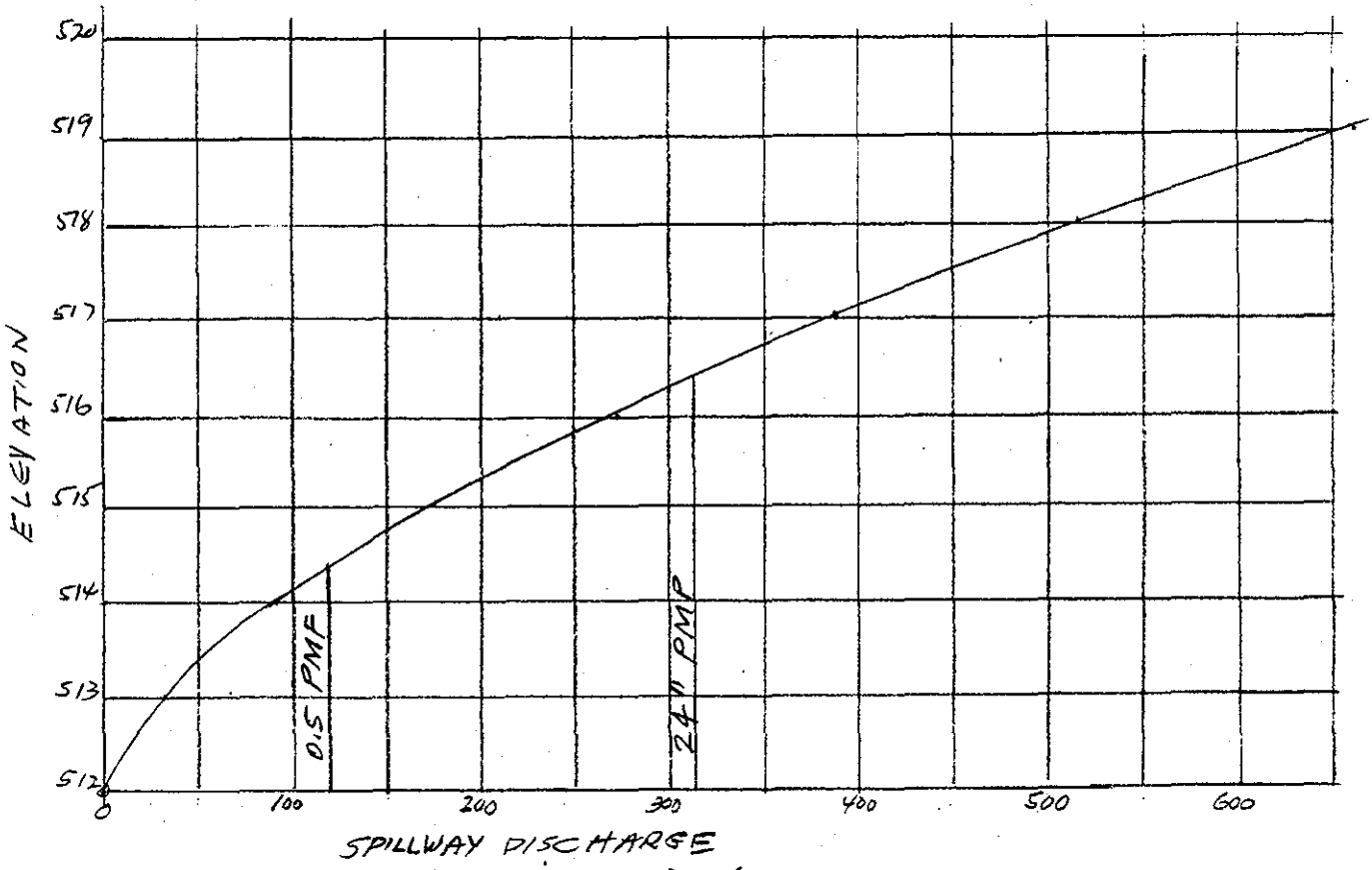
CHKD. BY..... DATE..... INSPECTION OF DAMS - CONN. & R.I. PROJECT.....

SUBJECT WASEL DAM - SPILLWAY CAPACITY



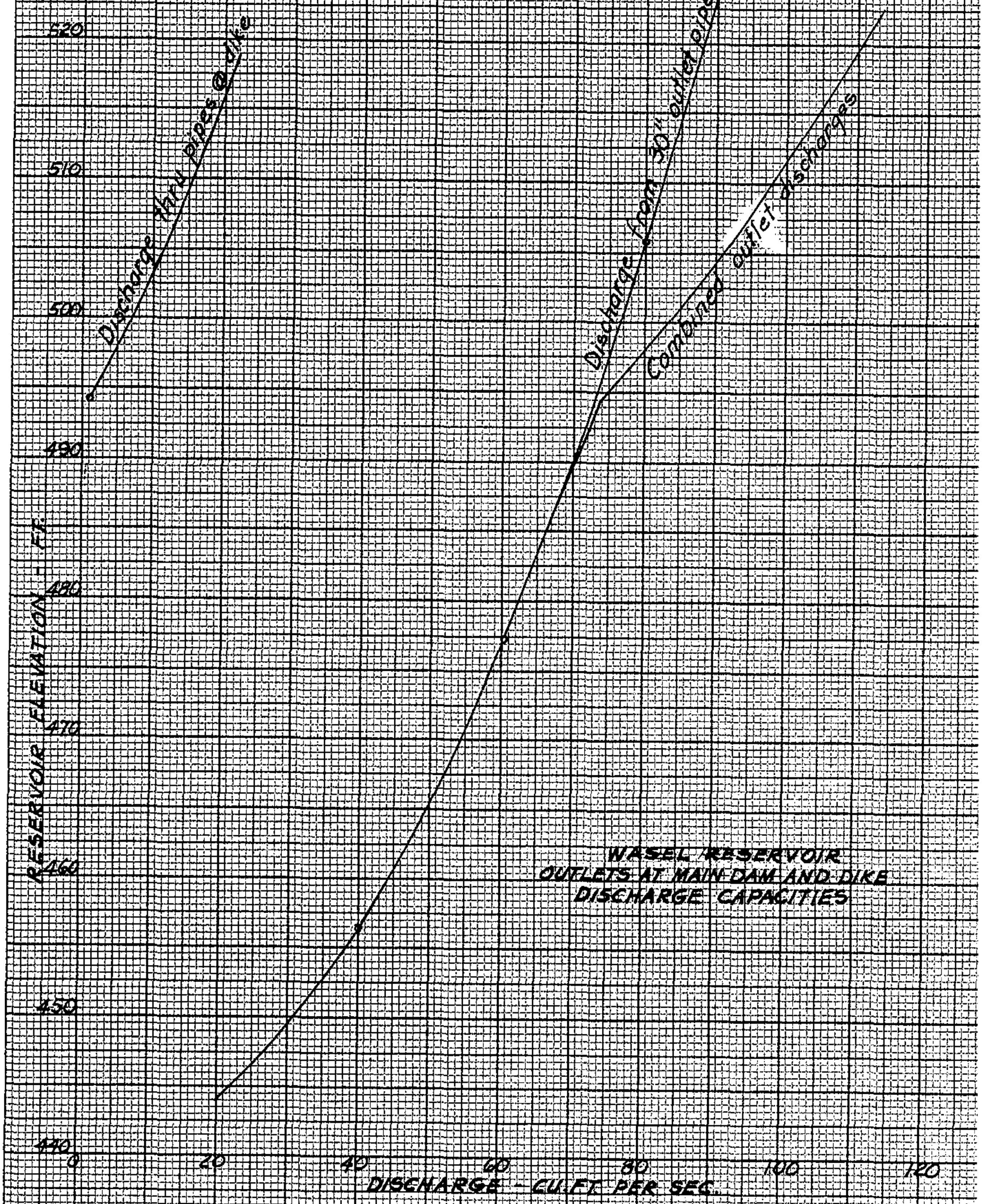
← 10' width section

Elev	H	C	ΔQ	Q/ft	Ave Q/ft	L	ΔQ	ΣQ
517	0	-	0	-			-	0
513	1	3.1	31	3.1	1.55	0.33	0.5	32
514	2	3.15	89	8.9	4.45	0.67	3	92
515	3	3.2	166	16.6	8.8	1.00	9	175
516	4	3.2	256	25.6	12.8	1.33	17	273
517	5	3.2	358	35.8	17.9	1.67	30	388
518	6	3.2	470	47.0	23.5	2.00	47	517
519	7	3.2	592	59.2	29.6	2.33	69	661
520	8	3.2	724	72.4	36.2	2.67	97	821



D-6

FIGURE 3
Sheet D-7



D-7

K+E STANDARD ® CROSS SECTION
10 X 10 TO THE HALF INCH

BY DJF DATE 12-3-78 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. D-8 OF ...

CHKD. BY ... DATE ... INSPECTION OF DAMS - Conn. & R.I. PROJECT ...

SUBJECT WASEL RESERVOIR - Outlet works discharge capacity

Main outlet works.

Losses — Friction $\frac{fL}{D}$ h_v = 13.08 h_v

Entrance @ US side 0.2 h_v = 0.2

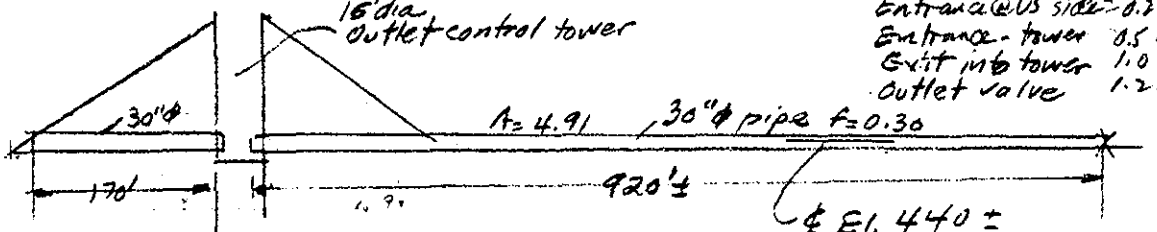
Entrance - tower 0.5 h_v = 0.5

Exit into tower 1.0 h_v 1.0

Outlet valve 1.2 h_v 1.2

15.98 h_v

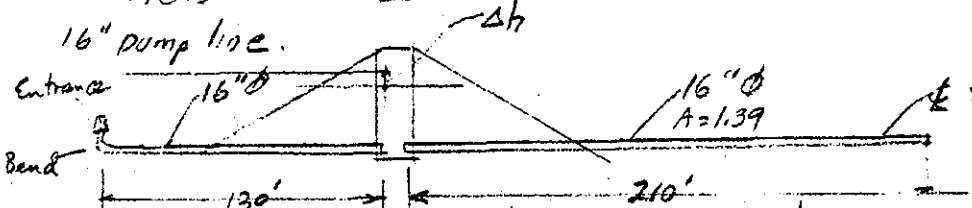
Say 16 h_v



Q cfs	v	h_v	Losses 16.h_v	Reservoir El.
90	18.33	5.22	83.5	523.5
80	16.29	4.12	66.0	506.0
60	12.22	2.32	37.1	477.1
40	8.15	1.03	16.5	456.5
20	4.07	0.26	4.1	444.1

Outlets at Dike -

16" pump line.



Upstream from tower

Q	v	h_v	Δh	Downstream from tower Δh	W.S. in tower	h	W.S. in Reservoir
20	14.39	3.21	16.7	25.7	520.0	42.4	536.7
15	10.79	1.81	9.4	14.5	508.8	23.9	518.2
10	7.19	0.80	4.2	6.4	500.7	7.6	504.9
5	3.60	0.20	1.0	1.6	495.9	2.6	496.9

Upstream from tower

Losses 16" Entrance pipe

Entrance 0.5 h_v = 0.5 h_v

Bend 0.2 h_v

Friction $0.035 \times \frac{130}{1.33}$ 3.5

Exit 1.0

Δh = 5.2 h_v

Downstream from tower

Losses:

Entrance 0.5 h_v

Friction $0.035 \times \frac{210}{1.33}$ = 5.53 h_v

Exit 1.0

8.03 h_v

Say 8.0 h_v

6" drain line L = 210 A = 0.196 ℄ El 485

Q	v	h_v	22.5 h_v	El. in tower
2.0	10.2	1.62	36.4	521.4
1.5	7.65	0.91	20.5	505.5
1.0	5.10	0.40	9.09	494.0
0.5	2.55	.10	2.27	487.3

Losses

Entrance 0.5 h_v

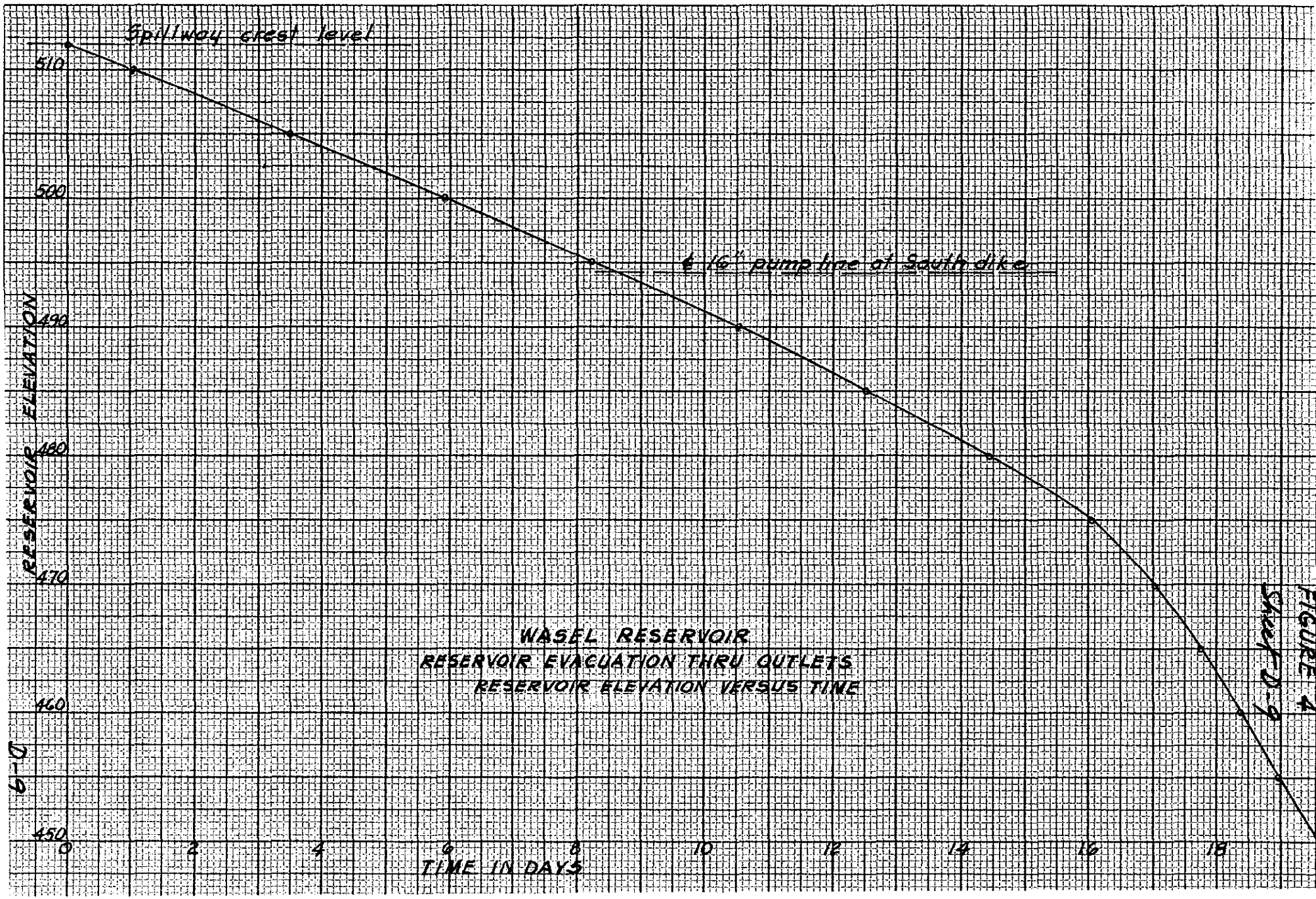
Exit 1.0

Friction $\frac{0.5 \times 210}{0.5}$ = 21.0

22.5 h_v

Combined 6" drain and 16" pump line

El.	Q
512	13.5
510	12.8
505	10.6
500	8.10
494.3	1.0


Spillway crest level
℄ 16" pump line at South dike
510
500
490
480
470
460
450
RESERVOIR ELEVATION
0
2
4
6
8
10
12
14
16
18
TIME IN DAYS
WASEL RESERVOIR
RESERVOIR EVACUATION THRU OUTLETS
RESERVOIR ELEVATION VERSUS TIME
D-9
FIGURE 4
Sheet D-9

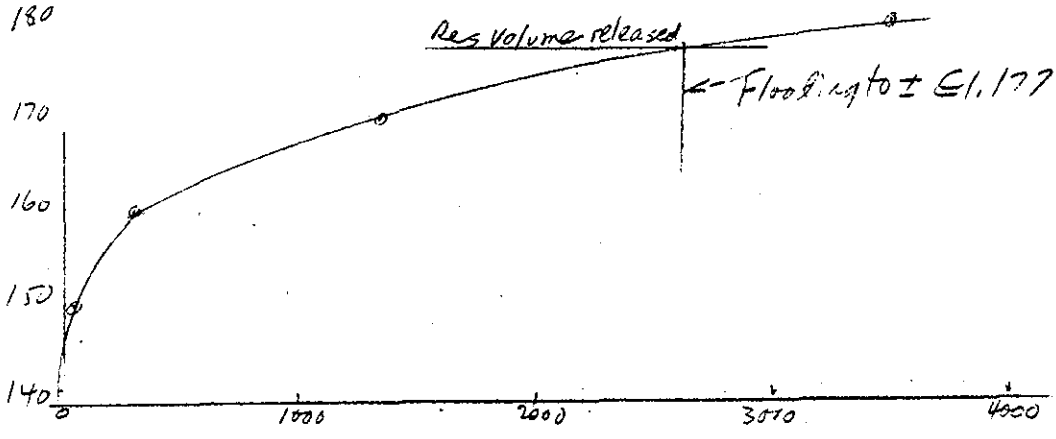
BY [illegible] DATE 12-5-78 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. D-10 OF...

CHKD. BY..... DATE..... INSPECTION OF DAMS - Conn. & R.I. PROJECT.....

SUBJECT WASEL RESERVOIR - AREAS OF FLOODING IN EVENT OF BREACH AT DAM.

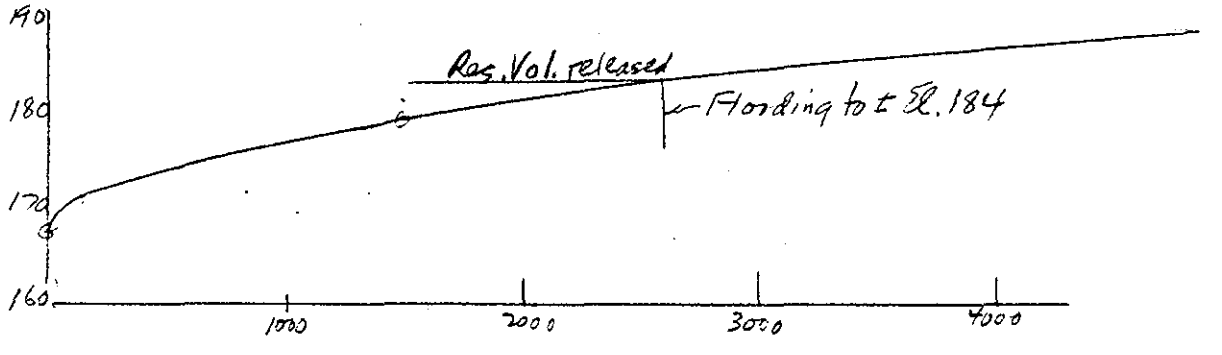
Area of flooding from Breach at Main Dam.
Area upstream from Willow Creek.

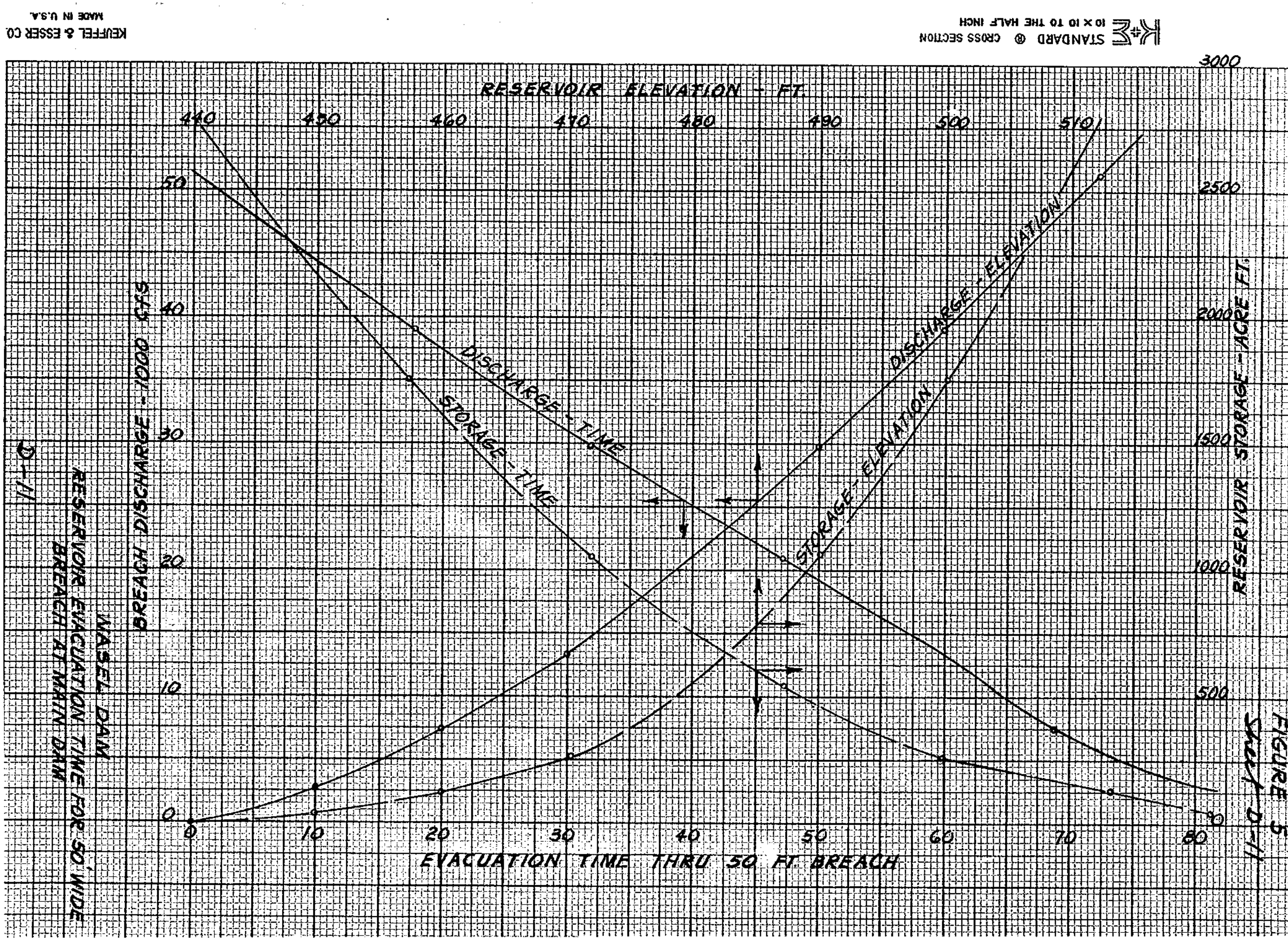
Elev.	Flooded ~~Area~~ - acres	Δ Volume	Σ Volume
140	0		0
150	7	35	35
160	50	285	320
170	159	1045	1365
180	271	2150	3515



Area of flooding from Breach at South Dike

Elev.	Area acres	Δ Vol	Σ Vol
168	0	-	0
170	28	28	28
180	263	1455	1483
190	564	4135	5618




RESERVOIR ELEVATION - FT.
440
450
460
470
480
490
500
510
BREACH DISCHARGE - 1000 CFS
50
40
30
20
10
0
RESERVOIR STORAGE - ACRE FT.
3000
2500
2000
1500
1000
500
0
DISCHARGE - TIME
STORAGE - TIME
DISCHARGE - ELEVATION
STORAGE - ELEVATION
0
10
20
30
40
50
60
70
80
EVACUATION TIME THRU 50 FT BREACH
WASEL DAM
RESERVOIR EVACUATION TIME FOR 50' WIDE
BREACH AT MAIN DAM
D-11
FIGURE 5
Sheet 1 D-11
KEUFFEL & ESSER CO.
MADE IN U.S.A.
K+E STANDARD CROSS SECTION
10 X 10 TO THE HALF INCH

BY RTF DATE 12-4-78 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. D-12 OF ___

CHKD. BY ___ DATE ___ INSPECTION OF DAMS - CONN & R.I. PROJECT ___

SUBJECT WASEL DAM RESERVOIR - DRAWDOWN AND BREACH ROUTING AT MAIN DAM

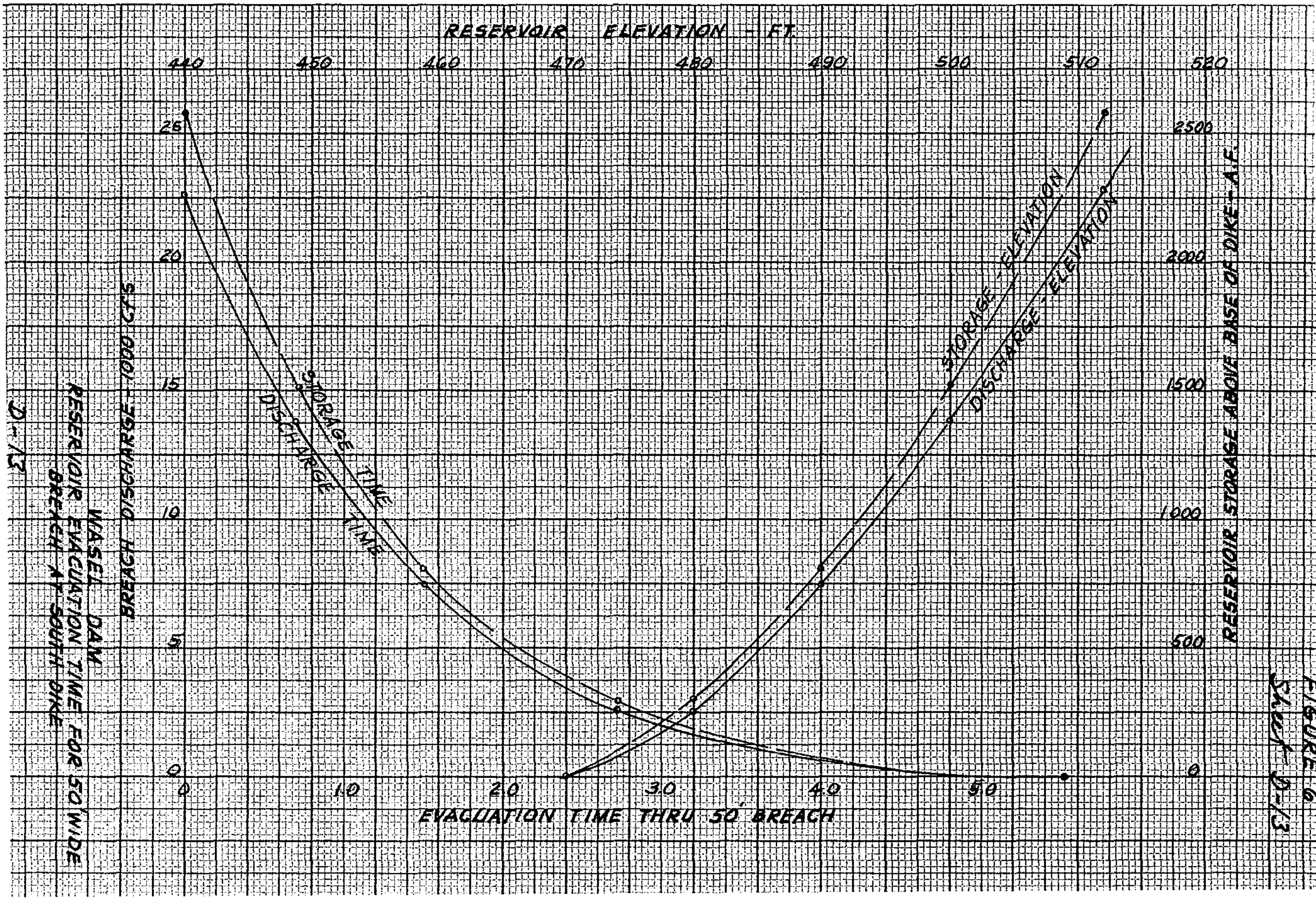
OUTLET WORKS, EVACUATION THRU OUTLETS

Elev.	Average Disch. thru outlets cfs	Average outflow in 24 hrs AF	Δ storage in reservoir AF	Δ time to release storage Days	Σ time from start of release Days
512					0
510	98.5	195	202	1.04	1.04
505	94.5	187	463	2.47	3.51
500	87.5	173	415	2.40	5.91
495	79.0	156	365	2.33	8.24
490	70.5	140	320	2.29	10.53
485	68.3	135	275	2.04	12.57
480	64.3	127	238	1.87	14.44
475	60.5	120	195	1.63	16.07
470	56.4	112	110	0.98	17.05
465	52.0	103	72.5	0.70	17.75
460	47.0	93	57.5	0.62	18.37
455	40.0	79	47.5	0.60	18.97
450	34.6	69	40	0.58	19.55
445	26.5	52	30	0.58	20.13

EVACUATION OF RESERVOIR THRU 50' BREACH IN MAIN DAM

$Q = 1.68 \times W \times H^{3/2}$

RES. ELEV	H	Q	Average Q	Average outflow in 60 min. AF	Δ storage in Res. AF	Δ time to release Storage - minutes	Σ time from start
512	72	51,300					
500	60	39,000	45,150	3725	1080	17.4	17.4
490	50	29,700	34,350	2834	685	14.5	31.9
480	40	21,200	24,450	2017	513	15.3	47.2
470	30	13,800	17,500	1444	305	12.7	59.9
460	20	7,500	10,650	879	130	8.9	68.8
450	10	2,650	5,075	419	87.5	12.5	81.3
440	0	0	1325	109	30	16.5	97.8


RESERVOIR ELEVATION - FT.
440
450
460
470
480
490
500
510
520
BREACH DISCHARGE - 1000 CFS
25
20
15
10
5
0
RESERVOIR STORAGE ABOVE BASE OF DIKE - A.F.
2500
2000
1500
1000
500
0
0
1.0
2.0
3.0
4.0
5.0
EVACUATION TIME THRU 50' BREACH
STORAGE TIME
DISCHARGE TIME
STORAGE - ELEVATION
DISCHARGE - ELEVATION
WASEL DAM
RESERVOIR EVACUATION TIME FOR 50' WIDE
BREACH AT SOUTH DIKE
D-13
FIGURE 6
Sheet D-13

BY GH DATE 12-5-78 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. D-14 OF

CHKD. BY DATE INSPECTION OF DAMS - Conn & RI PROJECT

SUBJECT WASEL DAM RESERVOIR - BREACH ROUTING AT DIKE

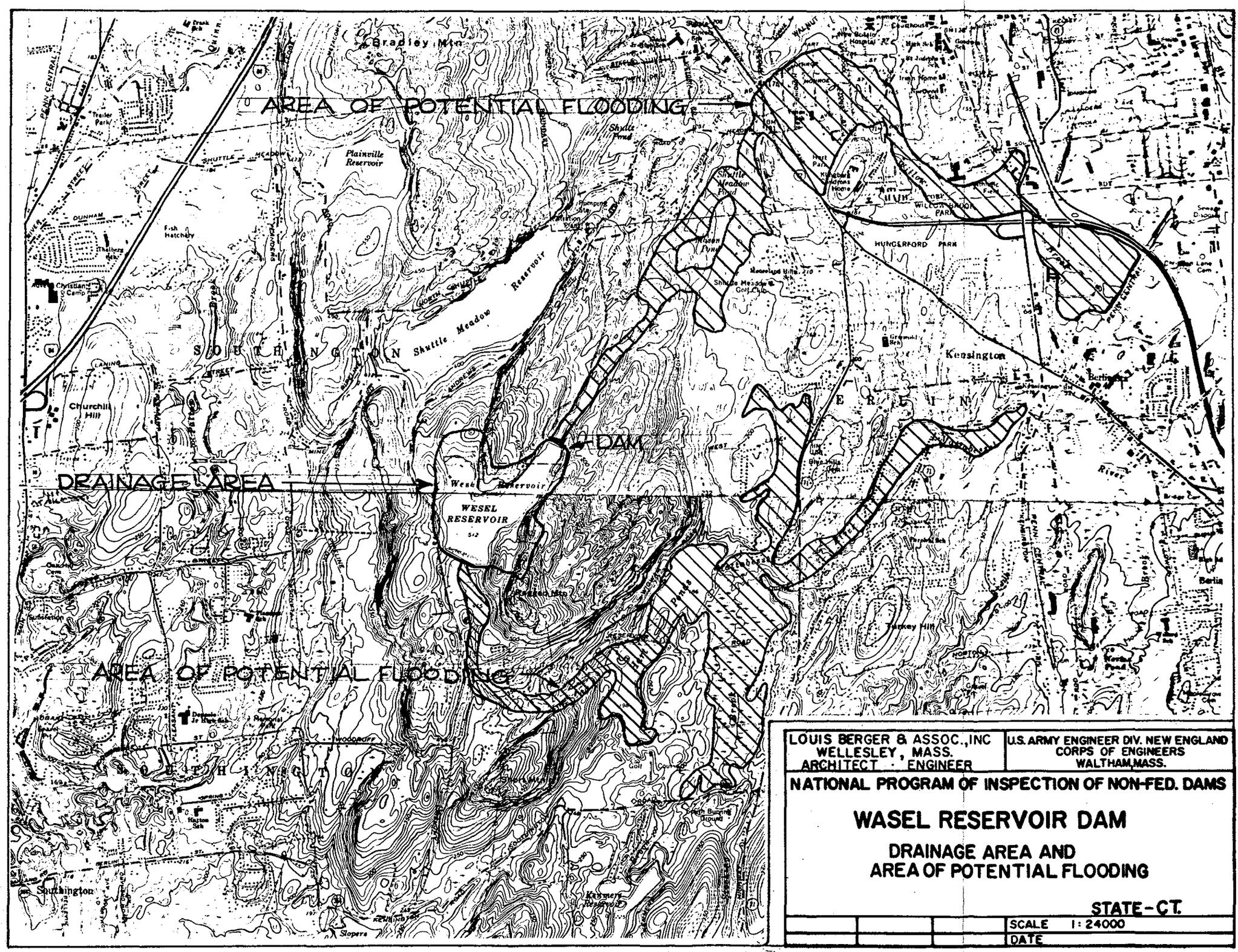
EVACUATION OF RESERVOIR THRU 50' BREACH IN DIKE

$Q = 1.68 \times W \times H^{3/2}$

Res El.	H	Q	Ave. Q	Average outflow per HR. AF	Δ Storage in Res. AF	Δ time to release Storage hrs	Σ time from start hrs	Σ Storage
512	42	22800					0	2583
500	30	13800	18300	1510	1080	0.72	0.72	1503
490	20	7500	10650	878	685	0.78	1.50	818
480	10	2650	5075	419	513	1.22	2.72	305
470	0	0	1325	109	305	2.80	5.52	0

EVACUATION OF RESERVOIR THRU 100' BREACH IN DIKE

Res El	H	Q.	Ave Q	Average outflow per hr	Δ Storage in Res. AF	Δ time to release Storage hrs	Σ time from start hrs
512	42	45,600					0
500	30	27,600	36,610	3020	1080	0.36	0.36
490	20	15,000	21,300	1756	685	0.39	0.75
480	10	5,300	10,150	838	513	0.61	1.36
470	0	0	2650	218	305	1.40	2.75



LOUIS BERGER & ASSOC., INC WELLESLEY, MASS. ARCHITECT · ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

WASEL RESERVOIR DAM

DRAINAGE AREA AND AREA OF POTENTIAL FLOODING

STATE - CT.

			SCALE 1:24000
			DATE

FIGURE 7 Sheet D-15

APPENDIX E

INFORMATION AS CONTAINED IN THE

NATIONAL INVENTORY OF DAMS